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The **cover illustration**—by Australian Museum's Anna Murray—is of the polychaete worm *Namanereis cavernicola*; the body is 1–2 mm thick. This species is reported from Mexico and Cuba in freshwater pools: in a limestone cave at 1650 m above sea level, in a *Colocasia*-swamp at about 400 m and in sand and fine gravel in a subterranean river. The various tentacular cirri are characters important in the classification and taxonomy of this kind of animal. This image was published in 1999 in Christopher Glasby's monographic study: The Namanereidinae (Polychaeta: Nereididae) *Records of the Australian Museum, Supplement* 25: 1–144. The faded impression (original SEM work by Geoff Avern) of an obscure gastropod mollusc barely 2 mm wide, provides background.

Australian Museum Scientific Publications are released as PDF files, at our website, free of charge and six months after publication. The above monograph on polychaete worms can be viewed at www.amonline.net.au/pdf/publications/1354_complete.pdf or purchased as a bound volume (AU$45.00) from the Australian Museum Shop.

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Salticidae (Arachnida: Araneae) from the Oriental, Australian and Pacific Regions, XV. New Species of Astieae from Australia

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ABSTRACT. Eight new species of Astieae spiders are described: *Arasia mullion, Helpis abnormis, H. kenilworthi, H. risdonica, H. tasmanica, Sondra bickeli, S. brindlei* and *S. samambrayi. Arasia aurea* (Koch) is transferred to the genus *Sondra*. Remarks on relationships of Astieae are provided and distributional maps of studied species are given.

ŻABKA, MAREK, 2002. Salticidae (Arachnida: Araneae) from the Oriental, Australian and Pacific regions, XV. New species of Astieae from Australia. *Records of the Australian Museum* 54(3): 257–268.

The group Astieae was proposed by Simon (1901) for nine Old and New World genera. The most comprehensive study of the group was provided by Wanless (1988). He described as new the genera *Jacksonoides, Sondra* and *Tauala* and excluded *Charippus* Thorell, *Lagnus* Koch, *Aruana* Strand, *Agelista* Simon, *Anaurus* Simon, *Lapsias* Koch and *Titanattus* Peckham & Peckham from Simon's list. Wanless also suggested that *Adoxotoma*, described by Simon (1909) in Astieae, should be excluded. My studies indicate that the genus should be retained within the group (Żabka, 2001).

More recently, two additional papers dealt with the Astieae (Żabka, 1995; Gardzińska, 1996), the former describing *Megaloastia* from Western Australia, and the latter dealing with new species of *Arasia, Helpis* and *Tauala*. Currently Astieae comprises the following genera: *Astia, Arasia, Helpis, Adoxotoma, Jacksonoides, Megaloastia, Sondra* and *Tauala*. The first three of which are found in Australia, on adjacent islands (Patoleta & Żabka, 1999), and in New Guinea; *Helpis* is found also in New Zealand (Żabka, in prep.). The other genera are recorded from Australia only.

Whether the group, as it is now formed, is monophyletic or not is a matter for future study. At least *Astia, Arasia, Helpis, Adoxotoma* and *Megaloastia* seem closely related, sharing similar body form, cheliceral dentition and genitalic structure. *Tauala* and *Sondra* differ in cephalothorax proportions (EFL:CL, CL:CW) and carapace form (box- rather than pear-shaped) whereas *Jacksonoides* has some genitalic similarities to *Aruana* (see Wanless, 1988).

Except for *Adoxotoma*, the cheliceral dentition is of the pluridentati pattern and is generally quite consistent within the Astieae. In *Adoxotoma* an intermediate pluri-fissidentati stage is present (Żabka, 2001).

Material and methods

The material is deposited in the Australian Museum, Sydney (AMS); specimens were collected during biological surveys conducted by the Museum. Specimens have been examined using methods described previosuly (Żabka, 1991a).

Abbreviations used are: AEW, anterior eyes width; AL, abdomen length; AMS, Australian Museum, Sydney; BB, B. Baehr; CL, cephalothorax length; CW, cephalothorax width; EFL, eye field length; GC, G. Cassis; GM, G. Milledge; *j*, (or, when more than one, *jj*) unsexed juvenile specimens; MG, M. Gray; MŻ, M. Żabka; NSW, New South Wales; PEW, posterior eyes width.

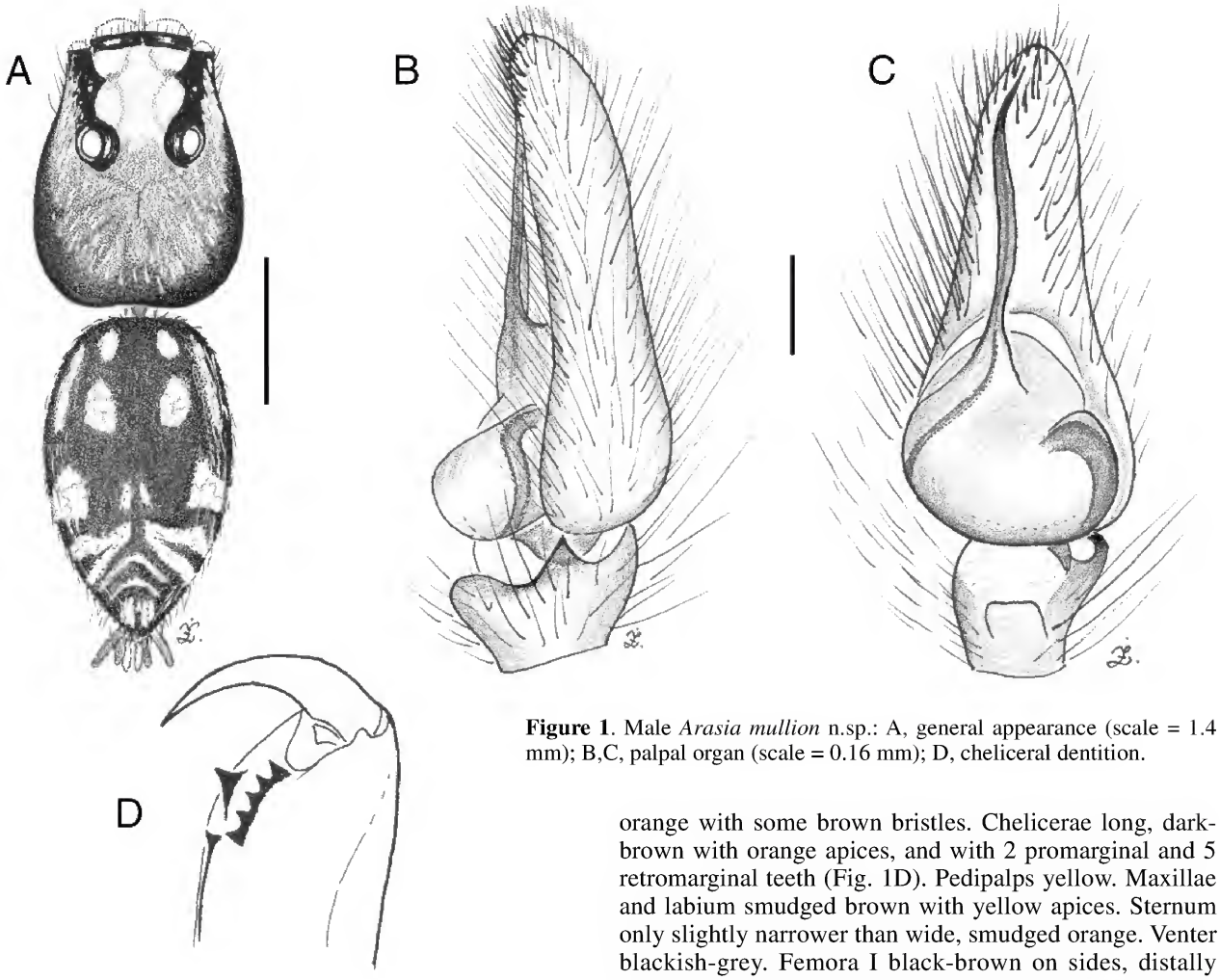


Figure 1. Male *Arasia mullion* n.sp.: A, general appearance (scale = 1.4 mm); B,C, palpal organ (scale = 0.16 mm); D, cheliceral dentition.

Genus *Arasia* Simon, 1901

Type species *Astia mollicoma* L. Koch, 1880, p. 1158.

Arasia mullion n.sp.

Fig. 1

Type material. HOLOTYPE Australia: New South Wales: ♂, Mullion State Forest, N of Orange, 33°11'S 145°08'E, under bark, 18 Oct 1999, M. Gray & G. Milledge, AMS KS59179.

Diagnosis. Abdominal pattern more contrasting than in other species of the genus, palpal tibia with ventral apophysis.

Description

Male (Fig. 1A). Cephalothorax pear-shaped, covered with rather numerous white adpressed hairs—especially on sides and with scattered brown bristles. Eye field contrasting orange, AME area dark-brown, other eyes surrounded with black. Thorax orange-brown anteriorly with radial darker markings and darkening towards lower margins. Abdomen dark-grey with light pattern made of guanine crystals. Hairs few, white—especially on sides, and brown. Spinnerets rather long, smudged light-brown. Clypeus narrow, dark-orange with some brown bristles. Chelicerae long, dark-brown with orange apices, and with 2 promarginal and 5 retromarginal teeth (Fig. 1D). Pedipalps yellow. Maxillae and labium smudged brown with yellow apices. Sternum only slightly narrower than wide, smudged orange. Venter blackish-grey. Femora I black-brown on sides, distally slightly lighter, dorsally and ventrally light-brown. Patellae I with dark sides, distally and dorsoventrally yellow, tibiae similar in colour, with 5–6 prolateral and 5 retrolateral

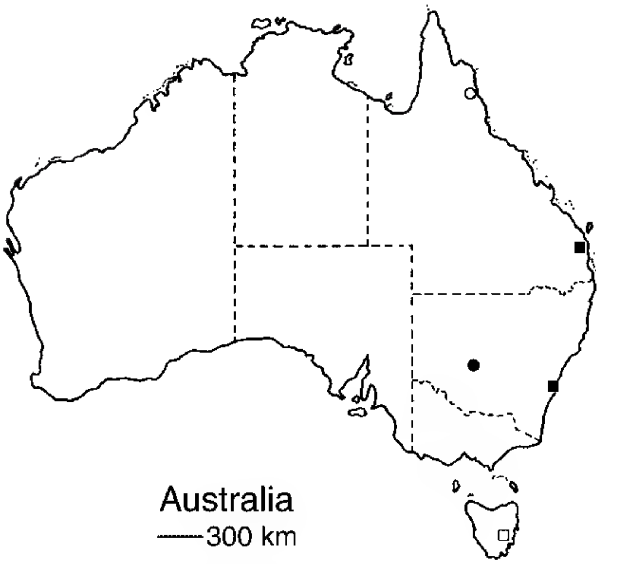


Figure 2. Distributions of *Arasia mullion* ●, *Helpis abnormis* ○, *Helpis kenilworthi* ■, and *Helpis risdonica* □.

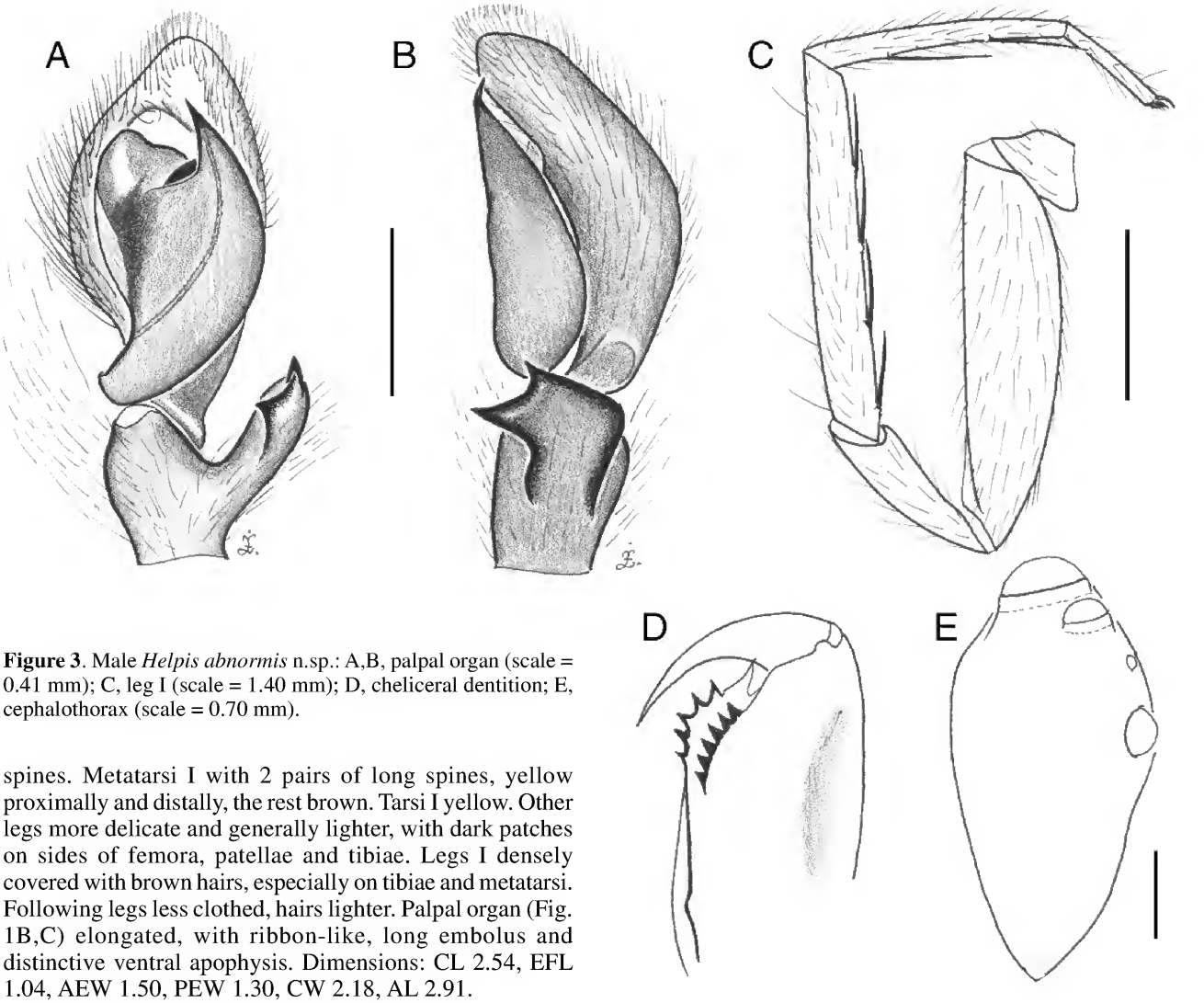


Figure 3. Male *Helpis abnormis* n.sp.: A,B, palpal organ (scale = 0.41 mm); C, leg I (scale = 1.40 mm); D, cheliceral dentition; E, cephalothorax (scale = 0.70 mm).

spines. Metatarsi I with 2 pairs of long spines, yellow proximally and distally, the rest brown. Tarsi I yellow. Other legs more delicate and generally lighter, with dark patches on sides of femora, patellae and tibiae. Legs I densely covered with brown hairs, especially on tibiae and metatarsi. Following legs less clothed, hairs lighter. Palpal organ (Fig. 1B,C) elongated, with ribbon-like, long embolus and distinctive ventral apophysis. Dimensions: CL 2.54, EFL 1.04, AEW 1.50, PEW 1.30, CW 2.18, AL 2.91.

Distribution (Fig. 2). Known only from Mullion State Forest (NSW).

Remarks. Only three species of *Arasia* are known: *A. mollicoma* (Koch), *A. eucalypti* Gardzińska and the present species, all of them are tree-trunk dwellers in open sclerophyll forests. *Arasia aurea* (Koch) listed by Wanless (1988) is excluded from *Adoxotoma* and transferred to the genus *Sondra* (see below).

Genus *Helpis* Simon, 1901

Type species *Astia minitabunda* L. Koch, 1880, p. 1160.

Helpis abnormis n.sp.

Fig. 3

Type material. HOLOTYPE Australia: Queensland: ♂, Mt Lewis Rd, 11.3 km by road E of Mossman–Mt Molloy Rd, 16°35'31"S 145°16'15"E, rainforest, 20 Apr 1998, G. Milledge, AMS KS38811.

Diagnosis. Differs from other species of *Helpis* by very distinctive palpal organ structure, longer and thinner legs.

Description

Male. Cephalothorax (Fig. 3E) brown, eye field and median thorax slightly lighter. Fovea region, sides and anterior part of eye field with clusters of white hairs. Brown bristles sparse, more numerous anteriorly. Abdomen macerated. Clypeus brown with sparse white and a few darker hairs. Chelicerae brown with lighter apices, promargin with 5, retromargin with 6 teeth (Fig. 3D). Maxillae and labium brown with lighter apices. Sternum smudged orange. Legs I long and slender (Fig. 3C), tarsi yellow, other podomeres brown, tibiae with 4 and metatarsi with 2 pairs of ventrolateral spines. Other legs similar in colour but more greyish, proximal parts of femora lighter dorsally and ventrally, following podomeres with darker and lighter bands around them. Palpal organ (Fig. 3A,B). Tibial apophysis massive, curved ventrally, furcate at the top. Tegulum with posterior lobe and thin seminal duct across it. Embolus dagger-like. Dimensions: CL 2.39, EFL 1.04, AEW 1.66, PEW 1.40, CW 1.92, AL 2.96.

Distribution (Fig. 2). Known only from type-locality.

Etymology. For abnormal palpal organ structure.

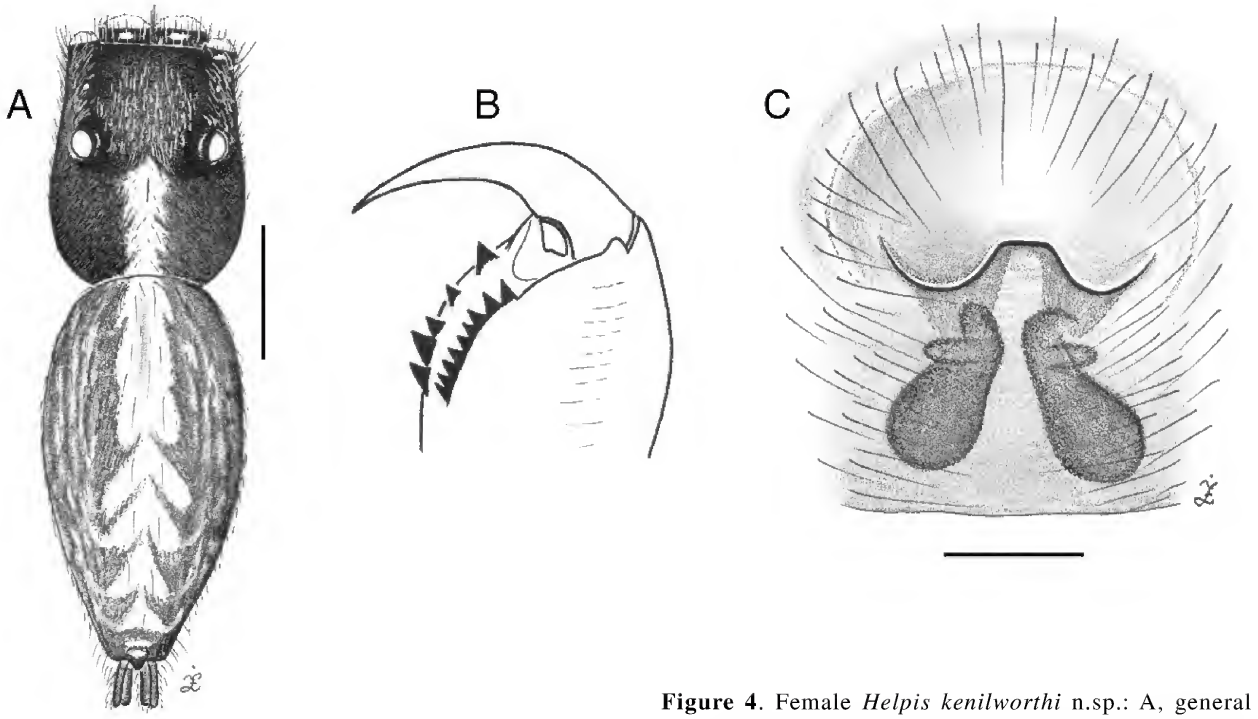
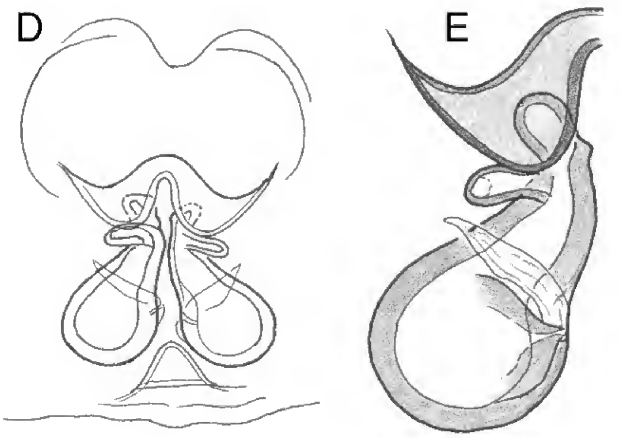


Figure 4. Female *Helpis kenilworthi* n.sp.: A, general appearance (scale = 1.70 mm); B, cheliceral dentition; C, epigyne (scale = 0.16 mm); D, internal genitalia; E, enlarged left side of internal genitalia.



***Helpis kenilworthi* n.sp.**

Fig. 4

Type material. HOLOTYPE Australia: Queensland: ♀, Kenilworth State Forest, Sunday Creel Rd, junction with Higher Creek Rd, 26°41'54"S 152°33'05"E, wet sclerophyll forest, 7 May 1998, G. Milledge, AMS KS56429. PARATYPES Australia: Queensland: ♀, Kenilworth SF, Sunday Creek Rd, 9.8 km W of Charlie Moreland Park, wet sclerophyll forest, 26°40'11"S 152°36'35"E, 6 May 1998, GM, AMS KS52186. New South Wales: ♀, Macquarie Pass NP, 34°S 150°39'E, wet sclerophyll forest, under fibre bark, 12 Sep 1999, BB, MŻ, AMS KS67503; 2♀, Sydney, Royal NP, 34°8'S 151°39'E, under bark, 24 Mar 1988, MŻ, AMS KS67504.

Diagnosis. Differs from other species by missing posterior abdominal light patch. Genitalia without long insemination ducts.

Description

Female holotype (Fig. 4A). Cephalothorax rather flat, generally brown, eye field lighter with white hairs, along thorax yellow stripe, eye surrounding black. Whole surface with quite numerous fine brown hairs and less numerous bristles—especially in anterior part. Abdomen grey-brown with yellow central pattern and with longitudinal rows of light spots laterally. Spinnerets long, smudged orange. Hairs sparse—brownish. Clypeus brown with some brown bristles. Chelicerae dark-brown, lighter apically with 5 promarginal and 9 retromarginal teeth (Fig. 4B). Pedipalps orange, clothed with light, grey and brown hairs and with a dorsal tarsal spine. Maxillae and labium elongate, the former twice as long as the latter, both brown with lighter apices. Sternum smudged orange. Venter yellow. Femora and tarsi I yellow, other podomeres honey-orange, tibiae with 4 proventral and 3–4 retroventral spines, metatarsi with 2 pairs of spines. Other legs yellow-orange. Legs not particularly hairy, brownish. Epigyne (Fig. 4C–E) very distinctive with anterior pocket-like cavities leading to short insemination ducts accompanied by accessory glands. Spermathecae pear-shaped. Posteriorly single central pocket visible after epigyne is cleared. Dimensions: CL 3.12, EFL 1.30, AEW 2.02, PEW 1.82, CW 2.39, AL 4.68.

Distribution (Fig. 2). Known from single localities in Queensland and New South Wales where it has been found on tree trunks in wet sclerophyll forests.

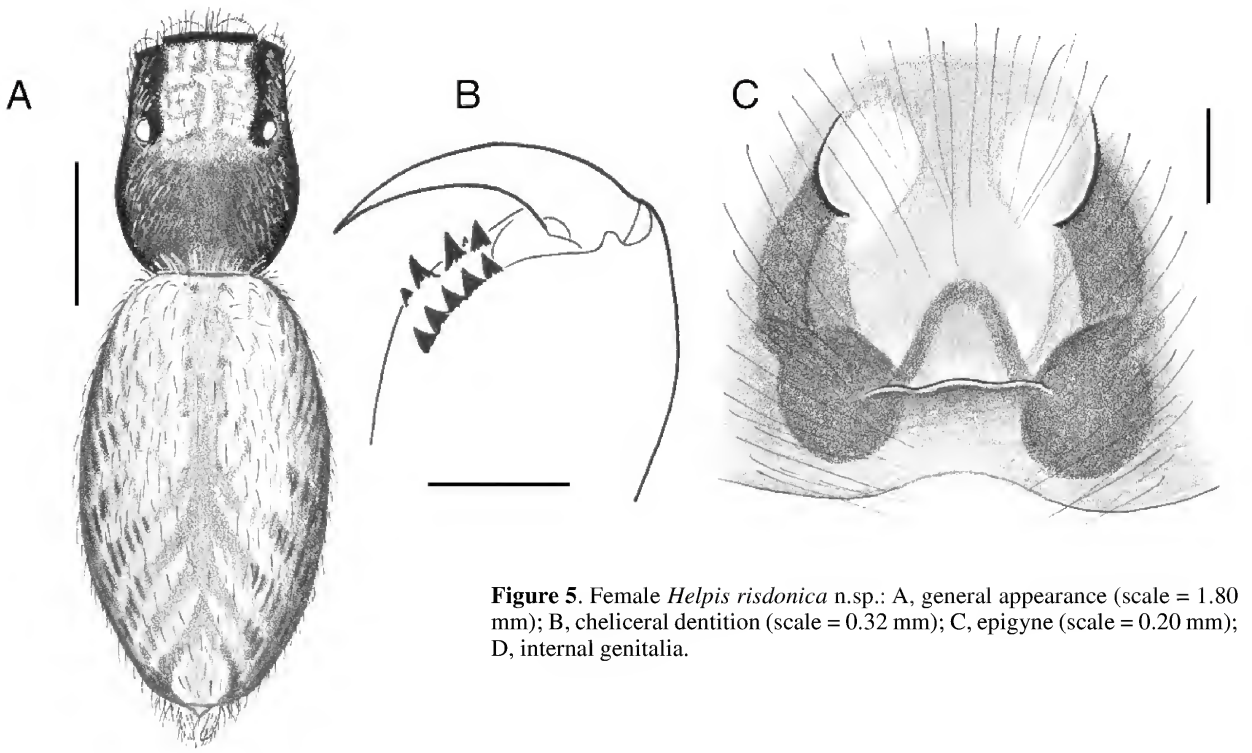


Figure 5. Female *Helpis risdonica* n.sp.: A, general appearance (scale = 1.80 mm); B, cheliceral dentition (scale = 0.32 mm); C, epigyne (scale = 0.20 mm); D, internal genitalia.

Helpis risdonica n.sp.

Fig. 5

Type material. HOLOTYPE Australia: Tasmania: ♀, Risdon, 42°49'S 147°21'E, 23 Aug 1947, Hickman, AMS KS30949. PARATYPE Australia: Tasmania: ♀, same data as holotype, AMS KS67499.

Diagnosis. The species has a very distinctive light colour pattern and epigyne.

Description

Female holotype (Fig. 5A). Eye field with orange contrasting spots, eye surrounding black. Thorax brown, darkening towards lower margin, white fine quite numerous—especially on sides. Whole cephalothorax with scattered brown bristles—more numerous anteriorly. Abdomen beige with dark pattern, turning blackish on sides. Whole surface with sparse brown bristles, anterior margin also with white ones. Spinnerets orange. Clypeus dark-orange with numerous white scale-like hairs and bristles and with single brown bristles. Chelicerae red-brown with 4–5 prolateral and 5–6 retrolateral teeth (Fig. 5B). Pedipalps proximally orange, distally brownish, with numerous light and single brown hairs. Maxillae and labium brown with lighter apices. Sternum dark orange, darker marginally. Venter beige along median part, towards sides greyish, then yellowish with dark spots. Legs I orange-brown with 3 pairs of tibial and 2 pairs of metatarsal spines. Other legs generally orange but podomeres lighter dorsally, ventrally and around median parts. Hairs not particularly numerous, brown. All femora with brown dorsal spines, each one with dark spot at its base—like in the next species. Epigyne (Fig. 5C,D) distinctive, copulatory openings well separated from each other, insemination ducts wide, accompanied by accessory glands. Central pocket more anteriorly than in other species. Dimensions: CL 2.86, EFL 1.24, AEW 1.76, PEW 1.66, CW 2.23, AL 5.30.

Distribution (Fig. 2). Known only from type-locality.

Helpis tasmanica n.sp.

Fig. 6

Type material. HOLOTYPE Australia: Tasmania: ♀, Cummings Range, 41°41'S 145°43'E, under flat rocks on summit, 30 Jan 1930, W. Hickman, AMS KS30940. PARATYPES: Australia, Tasmania: ♀, same data as holotype, AMS KS67500; ♀, Mt Wellington, 42°54'S 147°14'E, near summit, 27 Oct 1990, M. Gray, C. Horseman, J. Thompson, AMS KS34436.

Diagnosis. Closely related to *H. gracilis* Gardzińska (Gardzińska, 1996) but body much darker, cheliceral

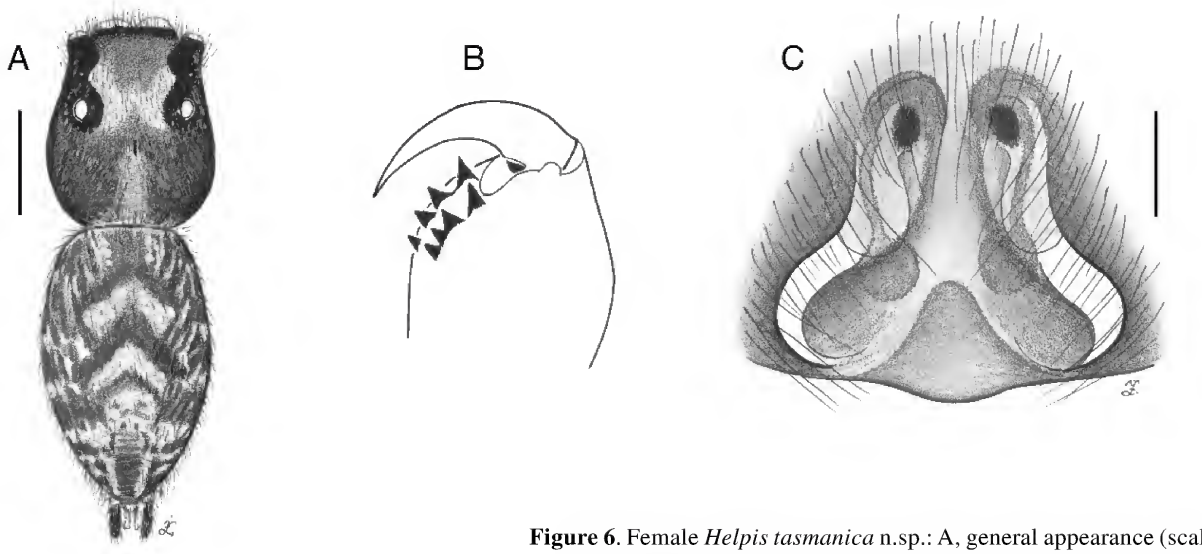
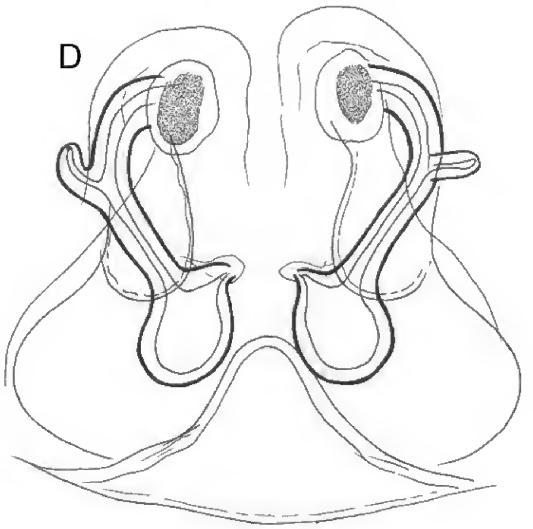


Figure 6. Female *Helpis tasmanica* n.sp.: A, general appearance (scale = 1.40 mm); B, cheliceral dentition; C, epigyne; D, internal genitalia (scale = 0.16 mm).



dentition different and abdomen with contrasting light pattern. In comparison to *H. minitabunda* Simon (Wanless, 1988) the accessory glands are located more proximally.

Description

Female holotype (Fig. 6A). Eye field anteriorly light brown, posteriorly with orange butterfly-shape patch, eye surrounding black with dark, rather long hairs. Abdomen brownish to dark-grey with light pattern of yellowish and white guanine spots. Hairiness moderately numerous, brown, anterior margin also with white hairs. Anterior and median spinnerets yellowish-grey, posterior ones brownish-grey. Clypeus orange with numerous yellowish and white hairs, longer of them overhanging towards chelicerae. Chelicerae red-brown with 4 teeth on both margins (Fig. 6B). Pedipalps brown, lighter distally with a flag of light hairs. Maxillae and labium brown with lighter apices. Sternum smudgy orange. Venter brownish to dark-grey, laterally with longitudinal light pattern. Dorsal and ventral parts of femora I yellowish, sides brown, other podomeres lighter—especially joint areas, tarsi orange. Tibiae and metatarsi I with 3 and 2 pairs of spines, respectively. Other legs brown, femora with light dorsal and ventral sides and orange bands around other podomeres. All legs with contrasting dark spots around the bases of femoral spines. Epigyne (Fig. 6C,D) with a distinctive bell-like posterior pocket and with two lateral grooves leading to anterior copulatory openings. Insemination ducts long, curved, rather narrow, spermathecae oval. Dimensions: CL 2.70, EFL 1.14, AEW 1.82, PEW 1.61, AW 2.23, AL 3.64.

Distribution (Fig. 7). Known only from localities in Tasmania.

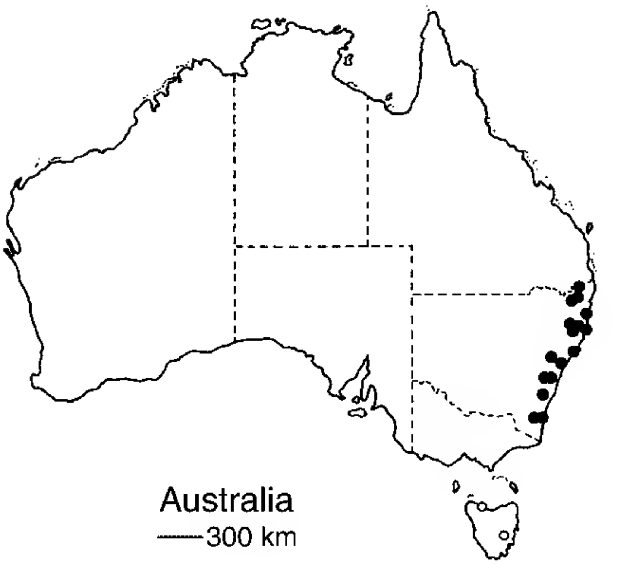


Figure 7. Distribution of *Helpis tasmanica* ○, and *Sondra aurea* ●.

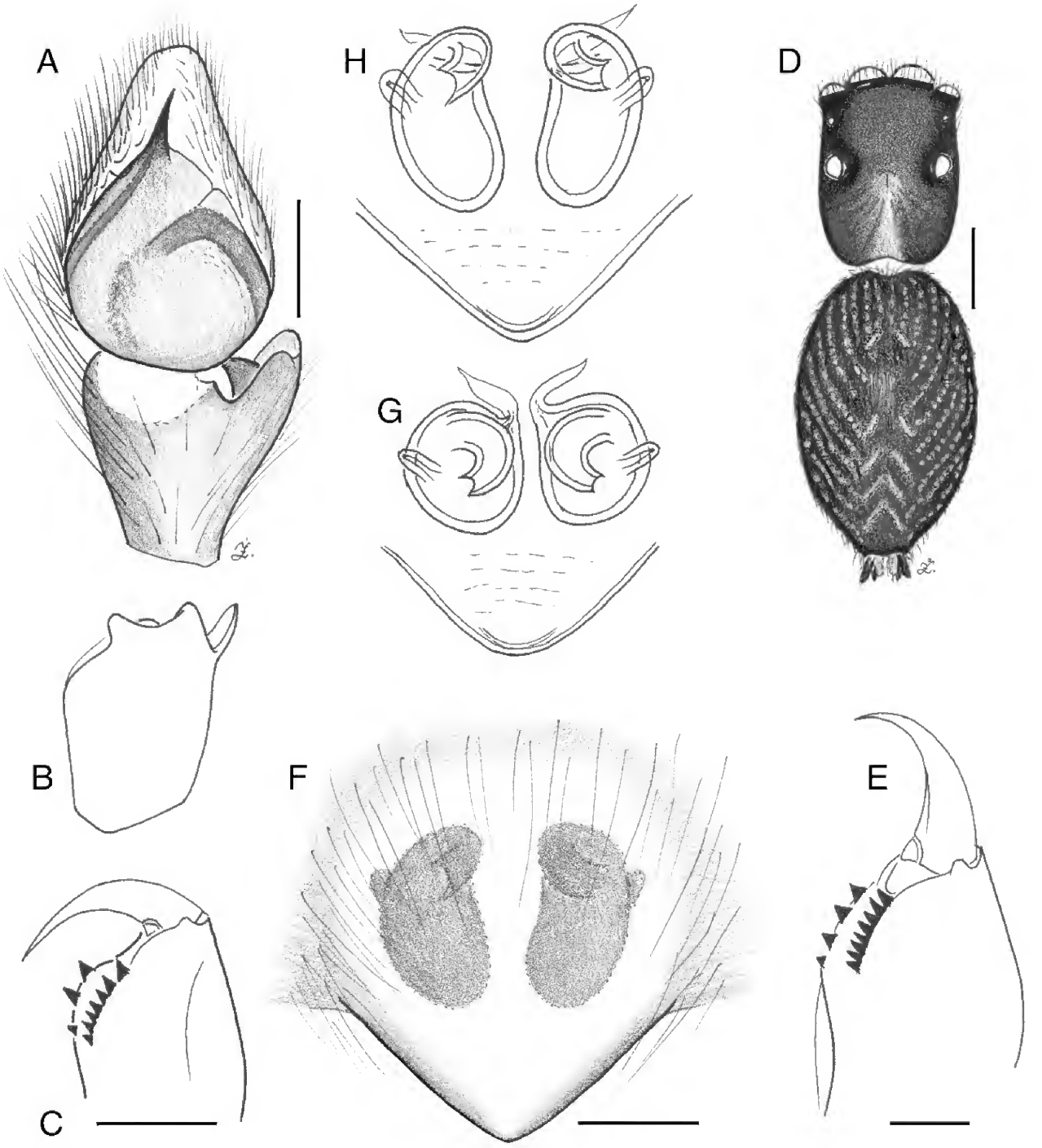


Figure 8. Male and female *Sondra aurea* (L. Koch): A, palpal organ (scale = 0.16 mm); B, retrolateral tibia; C, male cheliceral dentition (scale = 0.26 mm); D, female general appearance (scale = 0.87 mm); E, female cheliceral dentition (scale = 0.17 mm); F, epigyne (scale = 0.08 mm); G, internal genitalia posterior view; H, internal genitalia ventral view.

Sondra aurea (L. Koch, 1880), n.comb.

Fig. 8

Astia aurea L. Koch, 1880: 1167.
Astia aurea.–Simon, 1901: 436. Rainbow, 1911: 279. Roewer, 1954: 968. Bonnet, 1955: 768. Prószyński, 1971: 379.
Arasia aurea.–Wanless, 1988: 118. Żabka, 1991b: 59. Platnick, 1993: 736.

Material examined. Australia: New South Wales: 2♂, SW branch of Kunderang Stn Creek, 30°48'32"S 152°06'44"E, 18 Feb 1993, MG, GC, AMS KS40576; ♂, Grey Gums Forest Rd, Bulga SF, 1.1 km from Doyles River Rd, 31°33'35"S 152°14'36"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS42764; 3♂, Carrai SF, Copper Rd, 1 km from Carrai Rd, 30°57'44"S 152°23'E, pitfall traps, 9 Apr 1993, MG, GC, AMS KS42165; 8♂, 2♀, 2*jj*, Bulga SF, Wild Cattle Ck, 400 m NE of Spur Track, 31°36'24"S 152°07'45"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS42263; ♂, Boorook SF, Conlongan Rd, 1 km NW of Boorook Ck junction, midway between Boorook Ck and Gilcurry Ck., 28°51'24"S 152°11'27"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS38315; ♀, Ballengarra SF, Ballengarra Ck, crossing on Gregs Rd, 31°13'56"S 152°45'23"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS42078; ♂, Conglomerate SF, Old Growth Rd, 2.85 km from E end and 1.15 km from W end off Sherwood Rd, 30°06'49"S 153°03'51"E, pitfall traps, 18

Feb 1993, MG, GC, AMS KS42793; ♂, Bulga SF, 600 m N of Homewoods Rd, 2.8 km W of Knodingbul Rd, 31°37'03"S 152°07'44"E, 18 Feb 1993, MG, GC, AMS KS42731; ♂, Kunderang Trail, 1.85 km from homestead 50 m S of Wonga Gully, 30°48'56"S 152°07'44"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS40239; ♂, Beaury SF, N along Wallaby Ck Rd, 28°24'47"S 152°27'39"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS37885; ♂, Richmond Range SF, Goanna Ck Rd, 28°36'12"S 152°41'09"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS37785; ♂, ♀, Spirabo SF, very end of Wattle Ck Rd, on ridge overlooking Wattle Ck Gorge to the NE, 880 m, 29°18'35"S 152°11'33"E, 18 Feb 1993, MG, GC, AMS KS38286; ♂, Chichester SF, Allyn River Forest Rd, 32°09'06"S 151°28'53"E, pitfall traps, 18 Feb 1993, MG, GC, AMS KS38904; 3♂, 240 m E of junction of Kundarang East and Kundarang West Rds, pitfall traps, 30°48'53"S 152°02'09"E, 18 Feb 1993, MG, GC, AMS KS41403; ♀, Spirabo SF, Wattle Ck Rd, 1.6 km S of right angle bend to SE Trib. Ck flowing into middle Ck, 600 m above drop to gorge, 29°18'38"S 152°10'49"E, 18 Feb 1993, MG, GC, AMS KS38199; ♂, Tuross River Rd, Bodalla SF, site 2, 36°11'16"S 149°56'16E, 10 Mar 1999, L. Wilkie, R. Harris, H. Smith, AMS KS58776; ♂, Reservoir Link Rd, Bodalla SF, site 2, 36°7'15"S 150°2'49"E, 9 Mar 1999, L. Wilkie, R. Harris, H. Smith, AMS KS58778; ♂, Coomerang Rd, Dampier SF, site 1, 36°6'46"S 149°59'13"E, 10 Mar 1999, L. Wilkie, R. Harris, H. Smith, AMS KS58777; ♂, Murramarang NP, North Head Rd, site 1, 35°42'32"S 150°16'15"E, 17 Mar 1999, L. Wilkie, R. Harris, H. Smith, AMS KS58773; ♂, Richmond Beach Rd, Murramarang NP, site 1, 35°40'55"S 150°16'55"E, 17 Mar 1999, L. Wilkie, R. Harris, H. Smith, AMS KS58772; ♂, Ku-ring-gai Chase NP, near Terry Hills, dry sclerophyll, 33°37'S 151°17'E, 18 Aug 1992, D. Bickel, AMS KS56373; ♂, Buckenbowra Rd, 2 km W of Mogo, 35°47'27"S 150°6'36"E, 8 Mar 1999, J. Tarnawski, S. Lassau, AMS KS56367; ♀, Beecroft, 33°45'S 151°4'E, 20 Sep 1993, J. Noble, AMS KS58541; ♂, Booti Booti NP, 32°16'15"S 152°31'42"E, 29 Mar 1997, L. Wilkie, AMS KS58923; 4♀, Paynes Crossing "Wirraminna" via Wollombi, handsorting, 32°55'S 151°E, litter from forest beside Werong Ck near homestead, 27 May 1990, G.S. Hunt, C. Horseman, AMS KS23068; ♂, Bungonia Caves area near Information Centre, 34°48'2"S 150°0'57"E, 7 Jun 1990, G.S. Hunt, C. Horseman, AMS KS23052; ♀, Wattagan Mts, Mt Kyall beside Bakers Rd, 32°52'S 151°25'E, handsorting, dense forest, 7 May 1990, G.S. Hunt, C. Horseman, AMS KS23673; 2♂, 33°45'S 150°37'E, 33°45'S 150°37'E, B. Blaxland, 11 Apr 1997, AMS KS56392, KS56392; ♂, Beecroft, 33°45'S 151°4'E, 31 May 1995, J. Noble, AMS KS56516; ♂, Beecroft, 33°45'S 151°4'E, 5 Apr 1995, J. Noble, AMS KS56521; ♀, Hazelbrook, Winbourne Rd, site M6, 33°43'20"S 150°27'35"E, 3 Oct 1996, AMS KS51995; ♀, Mt Myall Wattagan Mts, dense forest beside Bakers Rd, 32°58'S 151°25'E, 7 May 1990, G.S. Hunt, C. Horseman, AMS KS23471; ♀, Tea Tree Hollow, Wirrimbirra Sanctuary nr Bargo, 34°16'S 150°34'E, under dense clumps of reeds (swampy), 17 Aug 1969, G.S. Hunt, AMS KS50154; ♀, Beecroft, 32°33'45"S 151°04'E, 3 Jul 1992, J. Noble, AMS KS46032; ♂, Wild Cattle Ck SF, 30°17'S 152°41'E, wet sclerophyll, 30 May 1993, V.W.H. Lorimer, AMS KS45818; ♂, Jamieson Pk, Narrabeen, 33°43'S 151°18'E, site 5, *Casuarina glauca*, open forest, pitfall traps, 19 Mar 1996, MG, H. Smith, AMS KS49748; ♀, Narrabeen, Jamieson Pk, site 3, 33°43'S 151°18'E, open forest, *Eucalyptus botryoides, Allocasuarina torulosa*, pitfall traps, 13 Mar 1996, MG, H.M. Smith, AMS KS49622; ♂, Wild Cattle Ck SF, 30°13'S 152°44'E, 30 May 1993, V.W.H. Lorimer, AMS KS45812; ♀, Beecroft, 33°45'S 151°4'E, 5 Oct 1997, J. Noble, AMS KS51663.

Diagnosis. Epigyne with large caudal lobe, spermathecae ampullate, accompanied by accessory glands. Tegulum without lamella as in some *Sondra* species.

Re-description

Male. Cephalothorax generally brown, fovea area and median part of thorax lighter, eye surrounding black. Hairs sparse, greyish and brown. Abdomen elongate, dark-grey with lighter pattern of lines of small spots. Hairs sparse, greyish and brown. Anterior and posterior spinnerets dark, median yellowish. Clypeus dark-brown with single light hairs and brown bristles. Chelicerae brown, promargin with 3, retromargin with 7 teeth (Fig. 8C). Pedipalps dark-brown, cymbium distally yellowish. Maxillae brown with orange apices. Labium smudgy brown with yellowish apex. Sternum brown, venter dark-grey. Legs I dark-brown, proximal patellae and tarsi yellowish, ventral femora orange, patellae and tibiae with ventral fringes of dark grey-brown hairs, tibiae with 3 and metatarsi with 2 pairs of ventrolateral spines. Legs II and III lighter, generally brown with darker sides and lighter ventrally and dorsally. Legs IV with orange and brownish bands around patellae and tibiae, metatarsi and tarsi smudged orange, the rest brownish. Palpal organ (Fig. 8A,B) with pear-shaped bulbus, embolus dagger-like, tibial apophyses massive and complicated in *Sondra*-like manner. Dimensions: CL 1.85, EFL 0.92, AEW 1.53, PEW 1.42, AW 1.49, AL 1.92.

Female (Fig. 8D). Cephalothorax short, rather robust with distinctive thoracic slope. Eye field brown, eyes with black surrounds. Thorax with dark-orange median stripe, the rest brown, darker towards lower margin, with radial lines from fovea area towards margins. Carapace not particularly hairy, grey and brownish, longer anteriorly. Abdomen elongate, dark-grey with lighter pattern of lines of small spots. Hairs sparse, greyish and brown. Anterior and posterior spinnerets dark, median yellowish. Clypeus brown with sparse brownish and greyish hairs. Chelicerae smudged orange, distally lighter, promargin with 4, retromargin with 8 teeth (Fig. 8E). Pedipalps smudged brown, dorsal femora and distal parts of podomeres lighter, hairs greyish. Maxillae smudged orange, labium smudged brown, both with lighter apices, the first elongate. Sternum smudged orange-brown. Venter dark-grey with longitudinal rows of light spots. Legs orange-brown, not particularly hairy. Legs I with 3 and 2 pairs of spines on tibiae and metatarsi, respectively. Legs II with similar spines. Epigyne (Fig. 8F–H) with posterior lobe—typical for *Sondra*, insemination ducts short, spermathecae bean-shape accompanied with accessory glands. Dimensions: CL 2.07, EFL 1.07, AEW 1.64, PEW 1.53, CW 1.67, AL 3.03.

Distribution (Fig. 7). The species is common in eastern Australia and is found in rainforest leaf litter.

Remarks. Wanless (1988) classified the species within *Arasia*. It has, however, typical characteristics of *Sondra*: cephalothorax is box-shaped rather than pear-shaped as in *Arasia*, the epigyne lacks long insemination ducts, the embolus is short and the tibial apophyses is massive and complicated like in some *Sondra* species. The species should be classified within the *Sondra nepenthicola* species group (Wanless, 1988).

Sondra bickeli n.sp.

Fig. 9

Type material. HOLOTYPE Australia: New South Wales: ♂, Wilson River Reserve, 31°12'S 152°28'E, 240 m, yellow pans swampy sidecreek, 16–19 Nov 1998, D. Bickel, AMS KS56556. PARATYPES Australia: New South Wales: ♂, same data as holotype, AMS KS67501; 3♂, Banda Road, about 4.5 km E of Hastings Forest Highway, 31°09'S 152°25'E, Mount Boss SF, 1100 m, MG, GC, 4 Feb–9 Apr 1993, AMS KS43110; ♂, Styx R SF, Cliffs Trail, 2.8 km from Oxley Rd, bottom end of Cliffs Trail, 1130 m, 30°33'28"S 152°21'16"E, 18 Feb 1993, MG, GC, AMS KS37665.

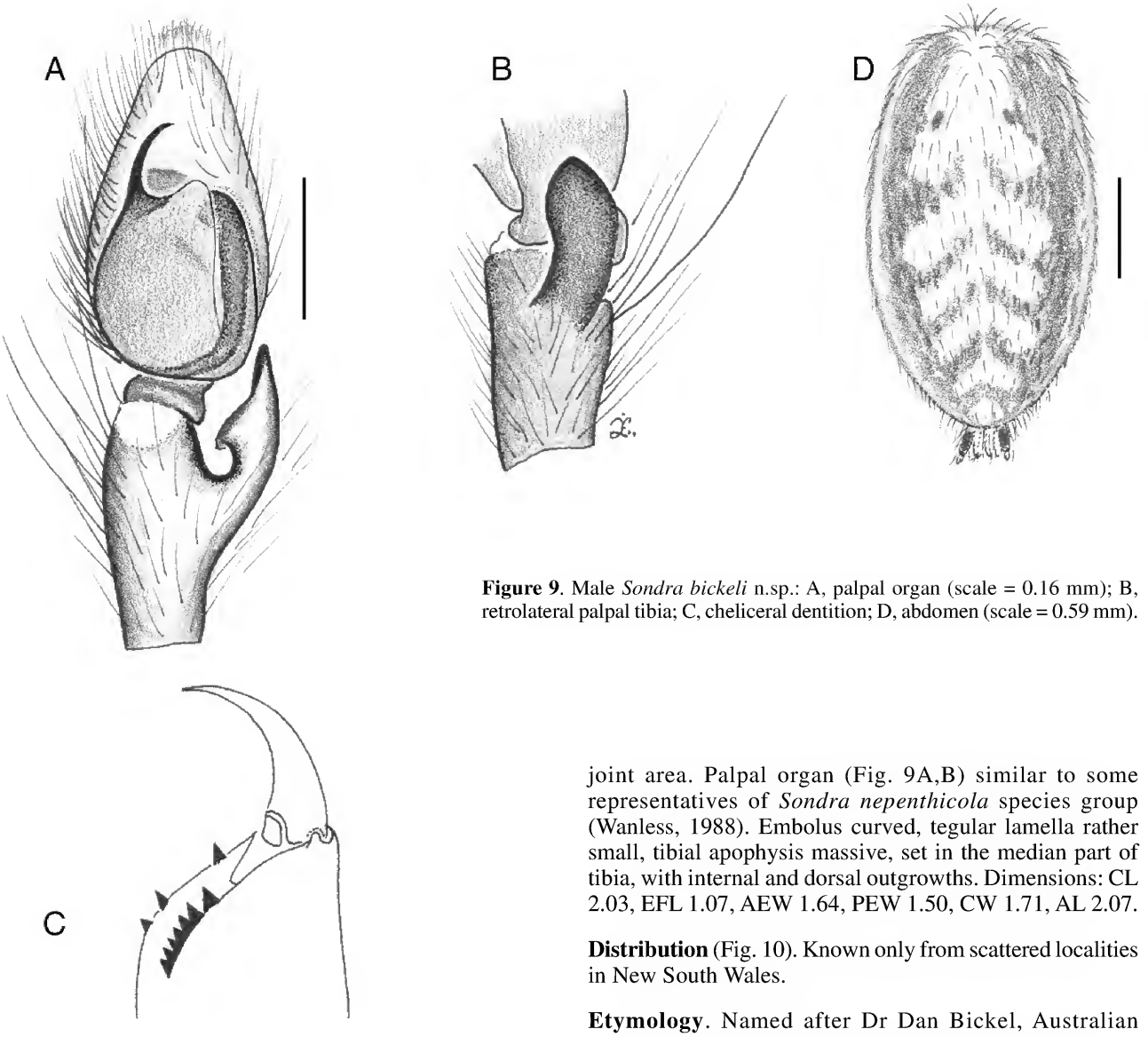


Figure 9. Male *Sondra bickeli* n.sp.: A, palpal organ (scale = 0.16 mm); B, retrolateral palpal tibia; C, cheliceral dentition; D, abdomen (scale = 0.59 mm).

Diagnosis. By the distinctive shapes of the embolus, tegular lamella and tibial apophysis.

Description

Male holotype. Eye field orange, eye surrounding black, except for AME, which is dark brown. Thorax smudged orange, darkening towards lower margin, with yellow median stripe. Abdomen (macerated) greyish brown with beige pattern (Fig. 9D). Spinnerets dark. Hairs cover on body sparse, light and brown. Clypeus orange, fringed with scale-like white yellow hairs. Chelicerae orange, with 3 promarginal and 7 retromarginal teeth (Fig. 9C). Pedipalps smudged orange. Maxillae and labium dark orange with lighter apices. Sternum yellow with darker margin. Venter beige. Legs I grey brown on sides, dorsal and ventral parts greyish orange, tarsi yellow. Distal femora, patellae and tibiae fringed with brown hairs, otherwise hairs not distinctive. Other legs gradually lighter. Legs IV with only traces of dark colour on sides of femora, patella, tibia and joint area. Palpal organ (Fig. 9A,B) similar to some representatives of *Sondra nepenthicola* species group (Wanless, 1988). Embolus curved, tegular lamella rather small, tibial apophysis massive, set in the median part of tibia, with internal and dorsal outgrowths. Dimensions: CL 2.03, EFL 1.07, AEW 1.64, PEW 1.50, CW 1.71, AL 2.07.

Distribution (Fig. 10). Known only from scattered localities in New South Wales.

Etymology. Named after Dr Dan Bickel, Australian

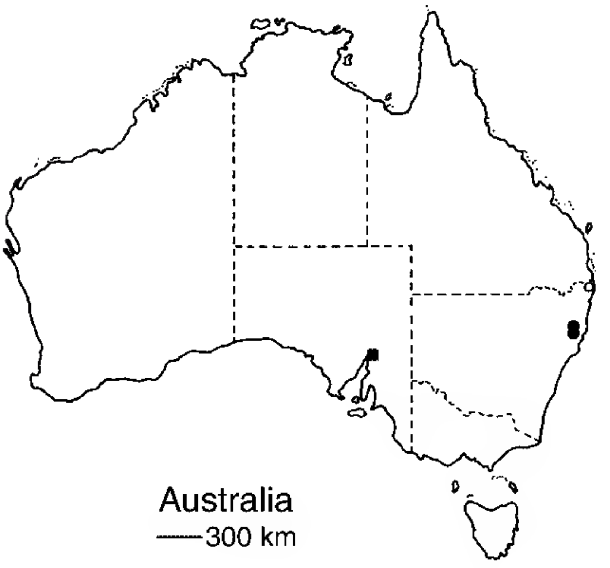


Figure 10. Distribution of *Sondra bickeli* ●, *Sondra brindlei* ○, and *Sondra samambrayi* ■.

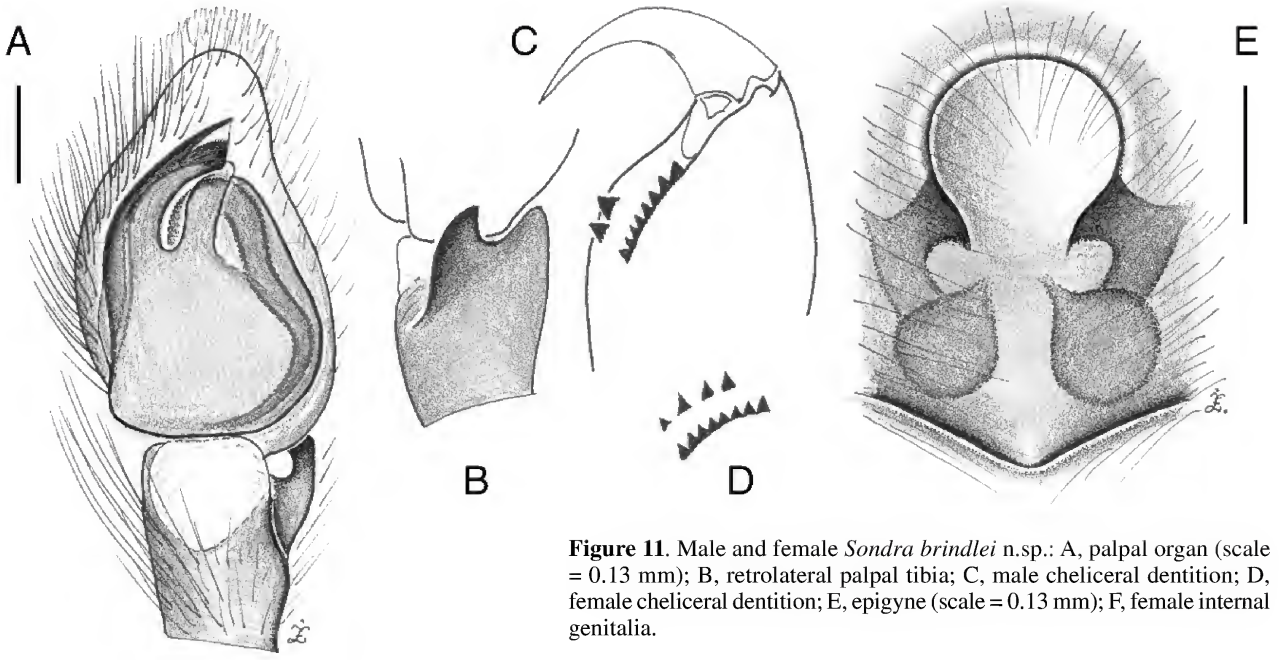


Figure 11. Male and female *Sondra brindlei* n.sp.: A, palpal organ (scale = 0.13 mm); B, retrolateral palpal tibia; C, male cheliceral dentition; D, female cheliceral dentition; E, epigyne (scale = 0.13 mm); F, female internal genitalia.

Museum entomologist, and collector of some of the material studied.

Sondra brindlei n.sp.

Fig. 11

Type material. HOLOTYPE Australia: New South Wales: ♂, Brindle Creek crossing with Brindle Creek Rd, 28°22'S 153°04'E, 4 Feb–9 Apr 1993, M. Gray & G. Cassis, AMS KS37705. PARATYPES Australia: New South Wales: ♀, same data as holotype, AMS KS67502; ♂, 3♀, 1*j*, Brindle Creek Road, 10 km E of Antarctic Beech picnic area, 28°22'S 153°05'E, Border Ranges Nation, 1040 m, 4 Feb–9 Apr 1993, MG, GC, AMS KS38105.

Diagnosis. Differs from the closely related species *S. raveni* Wanless (Wanless, 1988) by having a more rectangular posterior part of the tegulum, different tibial apophysis and different cheliceral dentition. The epigyne has a rounded anterior depression and copulatory openings are located more posteriorly.

Description

Male holotype. Eye field dark brown with 2 darker patches, eye surrounding black. Thorax brown with longitudinal orange stripe. Hairs fine, light and brown, rather sparse. Abdomen dark-grey with lighter herring-bone pattern. Median spinnerets yellowish, other dark-grey. Clypeus dark-brown, edged with fine single brown hairs. Chelicerae robust, brown, lighter apically with 2 promarginal and 8 retromarginal teeth (Fig. 11C). Pedipalps orange. Maxillae and labium brownish, lighter apically. Sternum yellowish, turning greyish towards margins. Venter dark-grey with 3 longitudinal rows of light spots. Legs I rather stout, femora smudged brown, further podomeres slightly lighter—all lighter on dorsal and ventral sides, tarsi yellow, tibiae with 3 and metatarsi with 2 pairs of spines. Other legs more delicate, femora smudged grey on sides, lighter dorsally and ventrally, further podomeres with brown and orange bands, tarsi yellowish. Hairs on legs not distinctive, fine, light and brown. Palpal organ (Fig. 11A,B) with large, lobe-like tegular lamella, embolus wide, tibial apophysis hooked. Dimensions: CL 1.99, EFL 0.92, AEW 1.46, PEW 1.35, CW 1.50, AL 1.89.

Female paratype. Cephalothorax lighter than in male: eye field smudged orange, eye surrounding black, fovea region and sides orange, thorax smudged orange-brown with darker radial markings. Abdomen (macerated) similar to that in male. Clypeus orange with 3 distinctive brown bristles. Chelicerae, pedipalps, maxillae, labium and sternum orange, the latter greyish towards margins. Promargin of chelicerae with 4 and retromargin with 8 teeth (Fig. 11D). Legs I orange, armed as in male. Other legs with orange and greyish bands around podomeres. Epigyne (Fig. 11E,F) with anterior round depression, insemination ducts wide, thick-walled, with accessory glands, spermathecae oval, fertilisation ducts

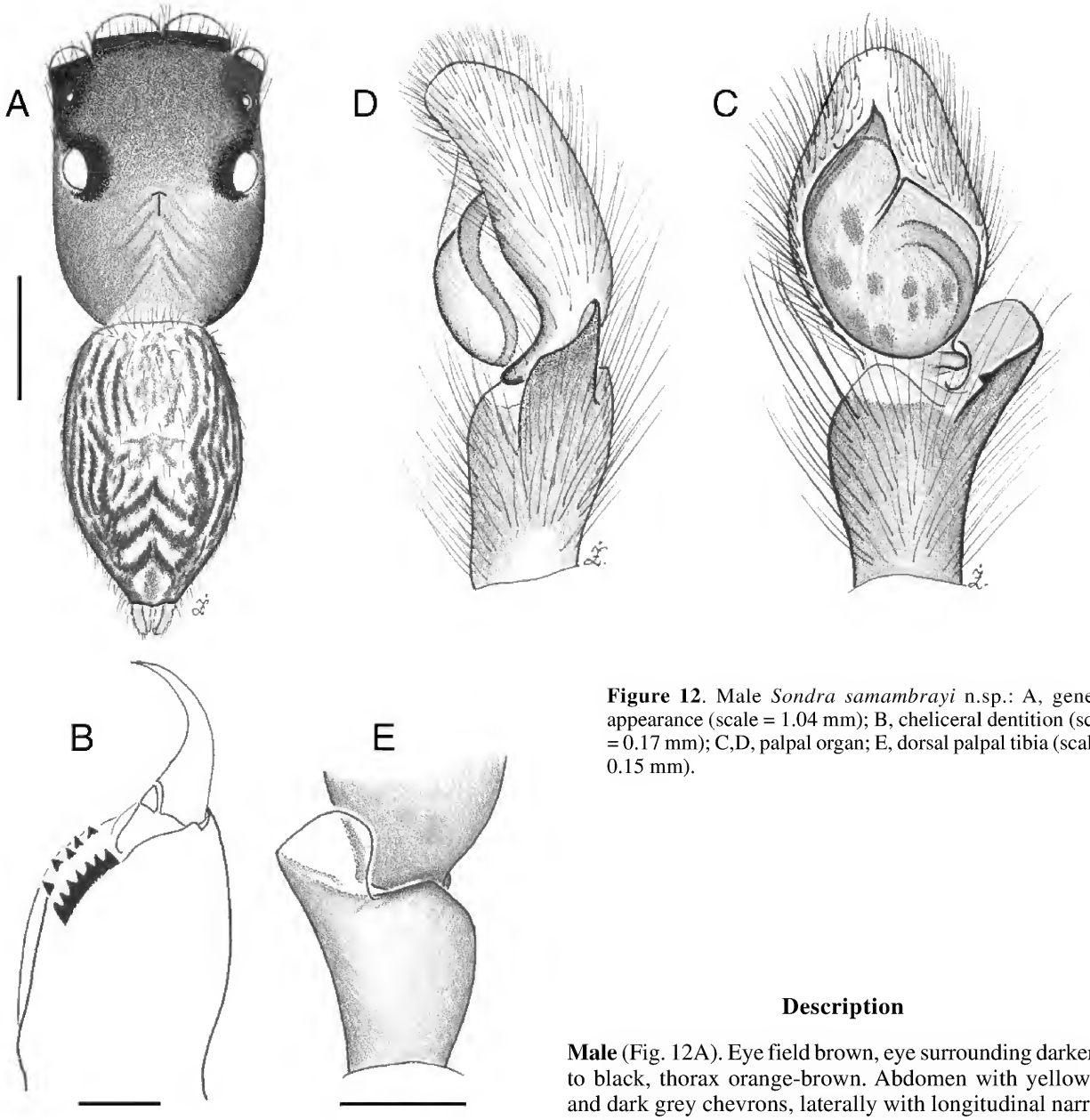


Figure 12. Male *Sondra samambrayi* n.sp.: A, general appearance (scale = 1.04 mm); B, cheliceral dentition (scale = 0.17 mm); C,D, palpal organ; E, dorsal palpal tibia (scale = 0.15 mm).

short. Dimensions: CL 1.96, EFL 0.92, AEW 1.50, PEW 1.35, CW 1.57, AL 2.32.

Distribution (Fig. 10). Known only from localities in New South Wales.

Sondra samambrayi n.sp.

Fig. 12

Type material. HOLOTYPE Australia: South Australia: ♂, Mambray Ck, 32°50'S 137°59'E, in logs and litter, 30 Apr 1973, M. Gray, AMS KS50905.

Diagnosis. Embolus short, cymbium with retrolateral outgrowth, tibial apophysis is massive and spatulate with small conical outgrowth.

Description

Male (Fig. 12A). Eye field brown, eye surrounding darker—to black, thorax orange-brown. Abdomen with yellowish and dark grey chevrons, laterally with longitudinal narrow light and dark lines. Spinnerets yellowish. Hairs few, pale and brownish. Clypeus light-brown, densely fringed with whitish hairs and with single brownish bristles. Chelicerae dark-orange, with 5 promarginal and 7 retromarginal teeth (Fig. 12B), frontal surfaces of chelicerae covered with white hairs. Pedipalps yellow at the base, remainder smudged orange. Maxillae and labium dark-orange, the former twice as long as the latter. Sternum yellow, darkening marginally. Venter with light and dark-grey longitudinal stripes. Legs I massive, generally brown, only proximal podomeres and tarsi yellow, dorsal femora, ventral patellae, dorsal and ventral tibiae fringed with dense brown hairs, tibiae with 3 and metatarsi with 2 pairs of spines. Legs II slender and lighter, dorsally and centrally yellowish, sides and joint area greyish-brown, ventral patellae and tibiae with dense hairs. Other legs similar to legs II though slightly lighter in colour, not very hairy. Palpal organ (Fig. 12C–E) with distinctive spatulate tibial apophysis. Tegular lamella missing, tegulum oval, embolus rather short. Dimensions: CL 2.50, EFL 1.14, AEW 1.92, PEW 1.78, CW 2.00, AL 2.42.

Distribution (Fig. 10). Known only from type-locality.

Etymology. The specific epithet is based on the place-names of the type-locality: South Australia and Mombray Creek.

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Salticidae (Arachnida: Araneae) from Oriental, Australian and Pacific Regions, XVI. New Species of *Grayenulla* and *Afraflacilla*

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ABSTRACT. Four new species, *Grayenulla spinimana, G. wilganea, Afraflacilla gunbar* and *A. milledgei*, are described from New South Wales and Western Australia. Remarks on relationships, biology and distribution of both genera are provided together with distributional maps.

ŻABKA, MAREK, & MICHAEL R. GRAY, 2002. Salticidae (Arachnida: Araneae) from Oriental, Australian and Pacific regions, XVI. New species of *Grayenulla* and *Afraflacilla*. *Records of the Australian Museum* 54(3): 269–274.

In comparison to coastal parts of the Australian continent, Salticidae from inland Australia are still poorly studied. Preliminary data indicate that the inland dry areas have their own, endemic fauns, genera *Grayenulla* and *Afraflacilla* being good examples (Żabka, 1992, 1993, unpubl.).

At present, seven species of *Grayenulla* are known from scattered localities in Western Australia. Even if found in coastal areas, they are limited in occurrence to savannah and semidesert habitats, being either ground or vegetation dwellers. The relationship of this genus to others is puzzling. *Grayenulla* shows some morphological similarities to South American *Hisucattus*, Asiatic *Synagelides* and Australian *Pseudosynagelides* (Galiano, 1987; Bohdanowicz, 1988; Żabka, 1991).

The genus *Afraflacilla* was first recorded from Australia by Żabka (1993). Seven species, including those described here, are known from locations scattered across the continent; individuals occupy tree trunks in savannah woodland and in open sclerophyll forests. The genus as a whole is very widespread, ranging from west Africa through the Middle East, southern Asia, New Guinea and Australia to western and middle Pacific islands. There are about 50 species known worldwide, most of them are described in *Pseudicius* (e.g., Prószyński, 1992; Berry *et al.*, 1998). *Festucula, Marchena* and *Pseudicius* are the closest relatives of *Afraflacilla* and they form a monophyletic group.

Material and methods

This study is based on material from the Australian Museum, Sydney (AMS) and the Western Australian Museum, Perth (WAM). Terminology and the method of specimen examination and measurement follow Żabka (1992, 1993).

Abbreviations used are as follows: AEW, anterior eyes width; AL, abdomen length; CL, cephalothorax length; CW, cephalothorax width; EFL, eye field length; PEW, posterior eyes width.

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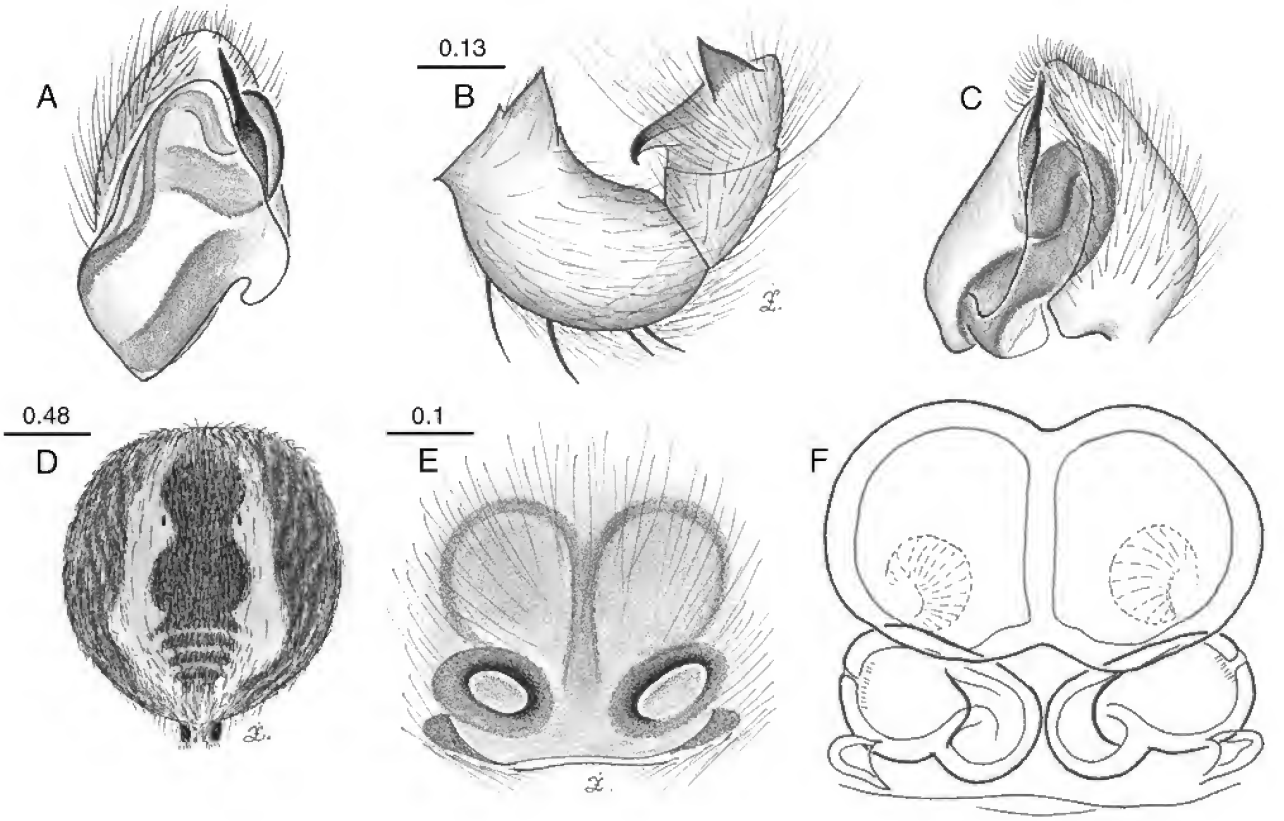

Figure 1. *Grayenulla spinimana* n.sp.: A–C, palpal organ; D, male abdominal pattern; E, epigyne; F, internal genitalia.

Genus *Grayenulla* Żabka, 1992

Grayenulla Żabka, 1992: 175.

Type species *Grayenulla dejongi* Żabka, 1992, by original designation.

Grayenulla spinimana n.sp.

Fig. 1

Type material. HOLOTYPE Australia: Western Australia: ♂, Cape Cuvier, Quobba Stn, 24°13'27.1"S 113°22'40.8"E, WAM/CALM Carnavon Survey, wet pits, P. West *et al.*, 21 Aug–29 Sep 1994, WAM 99/2185. PARATYPES Australia: Western Australia: 4♂, Cape Cuvier, Quobba Stn, 24°13'27.1"S 113°22'40.8"E, WAM/CALM Carnavon Survey, wet pits, 21 Aug–29 Sep 1994, P. West *et al.*, WAM 99/2186–9; 2♂, same data, WAM 99/2176–7; 5♂, same data, WAM 99/2191–5; ♂, same data, WAM 99/2196; 4♂, same data, WAM 99/2178–81; 2♂, 1*j*, same data, 15 Jan–30 May 1995, A. Sampey *et al.*, WAM 99/2182–4; ♂, same data, WAM 99/2190; 1♀, same data, WAM 99/2197; 1♂, Kennedy Range NP, 24°29'33.7"S 115°01'50.1"E, wet pits, 18 Aug–6 Oct 1994, M. Harvey *et al.*, WAM 99/2198; ♂, same data, E, N. Hall, WAM 99/2199.

Diagnosis. Differs from other species of *Grayenulla* by the abdominal pattern, embolus shape, the form of the seminal reservoir and the massive accessory glands.

Description

Male holotype. Cephalothorax brown. Eye field with numerous white and orange hairs—numerous and long in its median part and with brown bristles—more numerous anteriorly. Thorax with white hairs. Abdomen with central dark brownish stripe on beige background and dark lateral areas made of narrow lines. Abdomen hirsute, covered with numerous light or dark hairs on light or dark background, respectively. Spinnerets smudged grey-brown. Clypeus brown with yellowish, orange and brown hairs and bristles—less numerous than in other species. Chelicerae honey-brown with 3 promarginal teeth and single bicuspidate retromarginal tooth. Maxillae, labium and sternum brownish, venter beige. Legs I brown, II and III lighter brown, IV—smudged honey orange. All legs armed with numerous long spines (femora to metatarsi)—almost in oxyopid-like manner. Palpal organ (Fig. 1A–C). Femur with prolateral process, tibia with 2 distinctive apophyses: retrolateral conical, ventrolateral curved distally. Tegulum conical with retrolateral process. Embolus distally dagger-like. Dorsal femora, patellae and tibiae with contrasting long white hairs. Dimensions: CL 2.18, EFL 0.78, AEW 1.45, PEW 1.50, CW 1.71, AL 1.56.

Female. Eye field brownish, eye surrounds darker, thorax smudged brown. Cephalothorax hair cover dense, whitish, adpressed. Ocular area with brown protruding bristles numerous anteriorly. Abdomen (Fig. 1D) round, with distinctive longitudinal brown pattern with yellowish

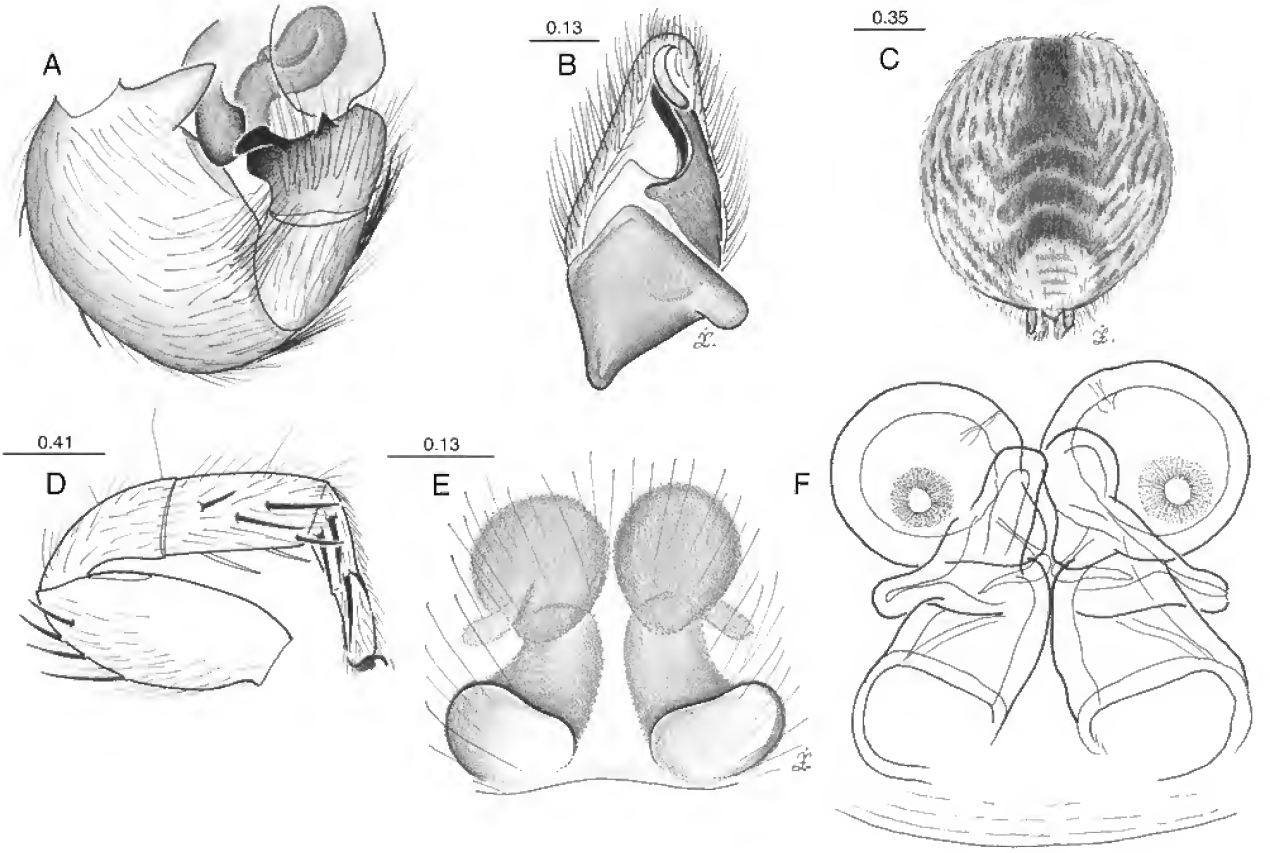

Figure 2. Male and female *Grayenulla wilganea* n.sp.: A,B, palpal organ; C, male abdominal pattern; D, male leg I; E, epigyne; F, internal genitalia.

margins and rows of smudged orange and grey-brown lateral stripes. Hairs numerous, yellowish and brownish on light and dark areas, respectively. Whole surface also with less numerous brown bristles, same as in male. Anterior and median spinnerets orange, posterior ones brownish. Clypeus orange-brown with numerous white hairs and single long bristles. Chelicerae light-brown with yellow chewing margins, promargin with 2 teeth, retromargin with one tricuspidate tooth. Pedipalps orange with numerous white, yellowish and brown hairs. Maxillae pale orange-yellow, labium brownish, both with pale chewing margins. Sternum smudged orange, with white protruding hairs marginally. Venter light beige with darker central pattern of transverse stripes. First legs rather stout with greyish bands in proximal and distal parts of podomeres. Other legs similar in colour though more delicate. All legs armed with numerous spines. Hair cover moderately dense, whitish and brownish. Bristles brown. Epigyne (Fig. 1E) with distinctive copulatory openings and with 2 posterior pockets. Internal genitalia (Fig. 1F) with unusually massive accessory glands and large oval spermathecae accompanied by their own accessory glands. Dimensions: CL 1.60, EFL 0.60, AEW 1.14, PEW 1.21, CW 1.35, AL 1.60.

Distribution (Fig. 5). Known only from localities in Western Australia.

Etymology. The proposed name refers to the spiny legs.

Grayenulla wilganea n.sp.

Fig. 2

Type material. HOLOTYPE Australia: New South Wales: ♂, Wilganea Station, 5.5 km NW of homestead, 90 km N of Burke, 29°21'16"S 146°16'59"E, 3 Mar 1993, L. Gibson, AMS KS45252. PARATYPES Australia: New South Wales: 3♂, ♀, same data as holotype, AMS KS45279.

Diagnosis. This species is distinguished by its abdominal colour pattern, an embolus that bears a hook-like sclerite, an epigyne without pockets and spermathecae that are relatively small.

Description

Male holotype. Cephalothorax brown. Eye field with numerous reddish hairs and brown bristles, the latter longer anteriorly. Thorax with numerous white hairs. Abdomen beige, lighter posteriorly, with brown chevrons (Fig. 2C). Spinnerets smudged yellow. Clypeus brown with white hairs, some of them curved down towards chelicerae. Chelicerae brown with lighter chewing margins, promargin with 3 teeth, retromargin with 1 tricuspidate tooth. Maxillae orange, labium smudged brown, both with lighter chewing margins. Venter beige with dark central stripe. All legs yellow except for legs I with darker lateral areas on the femora and smudged orange tibiae. First leg spination as in female (see Fig. 2D). Palpal organ (Fig. 2A,B). Femur very robust with proximal process. Tibia with two apophyses:

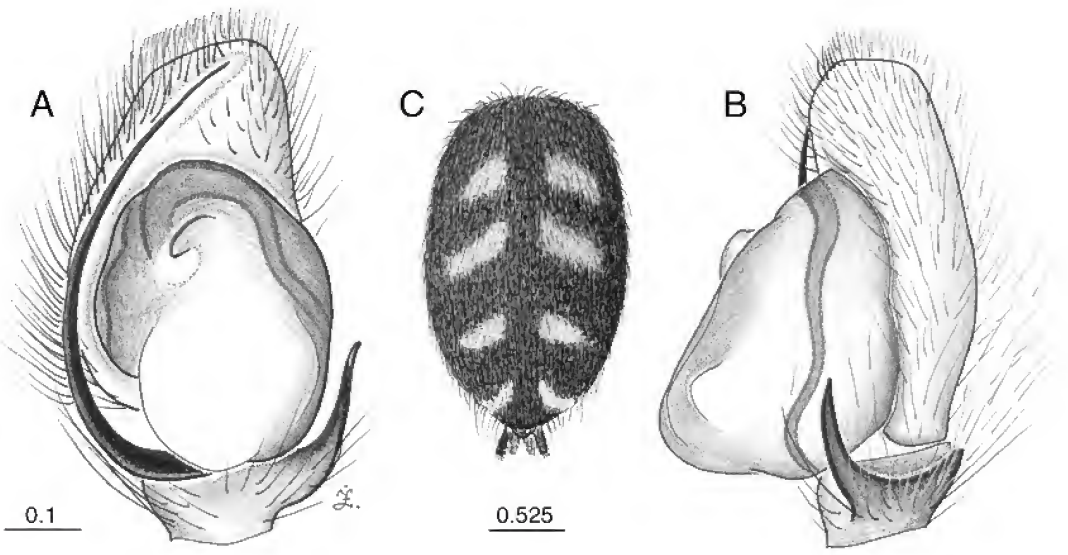

Figure 3. Male *Afraflacilla gunbar* n.sp.: A,B, palpal organ; C, abdominal pattern.

ventrolateral massive and laterally bent, retrolateral small, conical. Tegulum with 2 posterior lobes, embolus accompanied by large sclerite with hook-like ending. Dimensions: CL 1.57, EFL 0.75, AEW 1.14, PEW 1.07, CW 1.32, AL 1.39.

Female. Thorax brown, eye field darker, eye surrounds black. Whole surface covered with adpressed hairs—white laterally and orange dorsally. Eye field dark with strong dark brown bristles and more delicate, longer bristles around eyes. Abdomen beige with central brownish herring-bone pattern and "panther-like" irregular spots, hair cover of moderate density, light and brownish, with a few brown bristles anteriorly. Spinnerets greyish-yellow. Clypeus dark-orange centrally, smudged brown laterally, with numerous white hairs and fewer white and brownish bristles. Chelicerae dark-orange, each with an anterior darker vertical stripe and with yellow chewing margins. Prolateral cheliceral margin with 3 teeth, retrolateral margin with single tricuspidate tooth. Pedipalps orange with yellow and white hairs and brown bristles. Maxillae and labium dark-orange with lighter chewing margins. Sternum smudged orange-brown, edged with protruding white hairs. Venter beige, with "panther-like" spots laterally. Legs I moderately robust, yellow-orange, distal femora and joint areas of patella, tibia and metatarsus grey banded. Legs III–IV similar in colour, legs IV with additional prolateral dark femoral stripe. Legs II missing. All legs with numerous orange-brown spines. Hair cover moderate, white, orange and brownish. Epigyne (Fig. 2E–F). Without posterior pockets, copulatory openings well visible, insemination ducts broad with accessory glands. Spermathecae oval but relatively smaller than in other species. Dimensions: CL 2.07, EFL 0.75, AEW 0.92, PEW 0.89, CW 1.24, AL 2.67.

Distribution (Fig. 5). Known only from the type-locality in New South Wales.

Etymology. The proposed name is based on the type locality.

Genus *Afraflacilla* Berland & Millot, 1941

Afraflacilla Berland & Millot, 1941: 328.
Afraflacilla.–Żabka, 1993: 280.

Type species. *Afraflacilla bamakoi* Berland & Millot, 1941: 329, by original designation.

Afraflacilla gunbar n.sp.

Fig. 3

Type material. HOLOTYPE Australia: New South Wales: ♂, 2 km E of Gunbar, 34°3'S 145°24'E, ex nest of *Badumna candida*, 25 Apr 1987, M.R. Gray, AMS KS17618.

Diagnosis. This species has distinctive abdominal patterning and palpal organ form.

Description

Male. Thorax light brown. Eye field darker with black eye surrounds, central longitudinal stripe of white hairs and brown bristles—most numerous anteriorly. Sides orange, with numerous white hairs and with stridulatory tubercles (10 and 13 at left and right sides, respectively). Lower margins dark-grey. Abdomen (Fig. 3C) greyish-brown, darker centrally with light pattern of paired spots. Dark-grey hairs and less numerous bristles present along central and lateral sides. Spinnerets grey-brown. Clypeus orange with numerous white hairs and with 3 central brown bristles. Eyes surrounded with orange scale-like hairs. Chelicerae light-brown with 2 prolateral teeth and 1 retrolateral tooth. Maxillae and labium elongate, orange with lighter chewing margins. Sternum smudged orange, darker marginally. Venter beige. First legs massive, dark-orange, femora with 5–6 stridulatory tubercles, tibiae with a single anterolateral spine and metatarsi with 2 pairs of short spines. Palpal organ (Fig. 3A,B). typical for the genus. Tegulum with anterior process, embolus curving around the tegulum. Tibial apophysis long and thin with dorsolateral process. Dimensions: CL 1.82, EFL 0.71, AEW 0.92, PEW 0.87, CW 1.21, AL 2.42.

Distribution (Fig. 5). Known only from localities in New South Wales.

Etymology. The proposed name is based on the type locality.

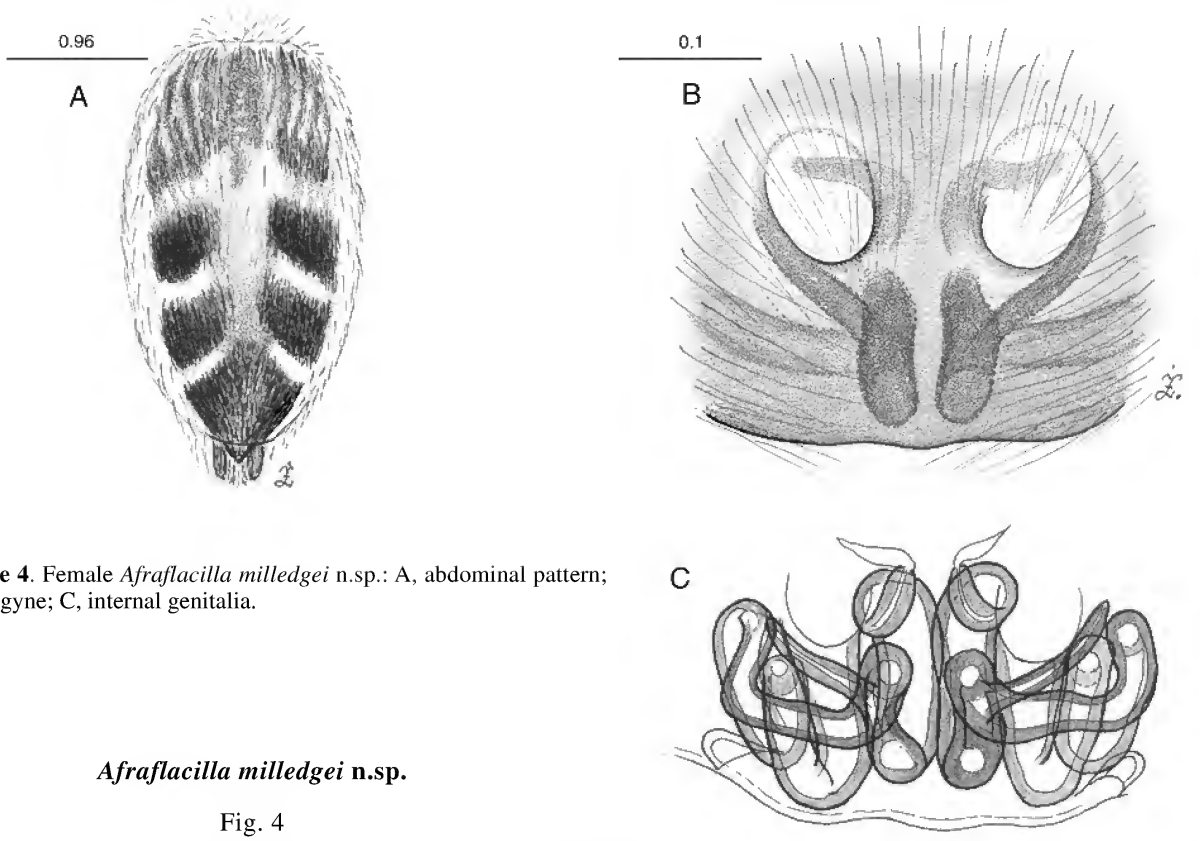

Figure 4. Female *Afraflacilla milledgei* n.sp.: A, abdominal pattern; B, epigyne; C, internal genitalia.

Afraflacilla milledgei n.sp.

Fig. 4

Type material. HOLOTYPE Australia: Western Australia: ♀, Kimberley Region, Great Northern Highway, 52 km N of Turkey Creek, 16°38'05"S 128°11'38"E, beating savannah woodland, 9 Jun 1999, M. Gray, G. Milledge, H. Smith, AMS KS59857.

Diagnosis. This species can be recognised by its epigyne and internal genitalia.

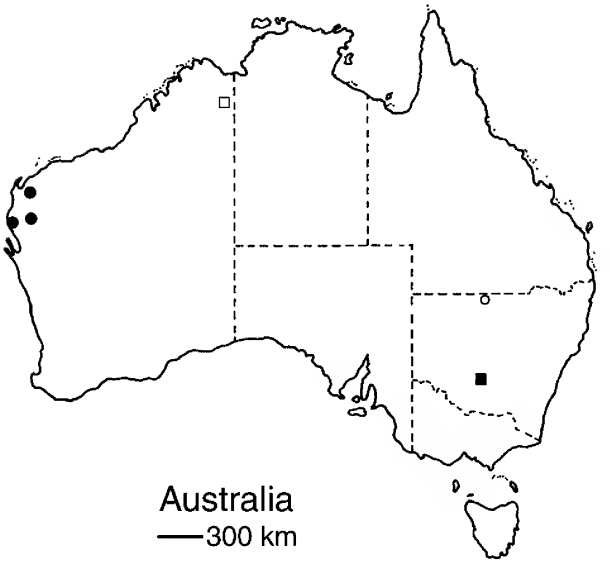

Figure 5. Distributions of *Grayenulla spinimana* ●, *Grayenulla wilganea* ○, *Afraflacilla gunbar* ■, and *Afraflacilla milledgei* □.

Description

Female. Thorax brown with radial pattern of darker lines. Eye field brown-black. Fovea region and lateral thorax orange, the latter with a narrow dark grey marginal band. 11 and 9 stridulatory tubercles on left and right side of cephalothorax, respectively. Cephalothorax covered with numerous white hairs, eye field with additional brown bristles—most numerous anteriorly. Abdomen (Fig. 4A) with yellowish and dark pattern, the latter made of pigment and dense hairs. Clypeus orange, densely covered with white scale-like and longer yellowish hairs. Chelicerae dark orange with 2 prolateral teeth and 1 retrolateral tooth. Pedipalps yellow, covered with long yellowish hairs. Legs yellow with sparse white hair cover and long brown bristles. Femora I with 5–6 stridulatory tubercles. Epigyne (Fig. 4B,C) relatively short, with 2 anterior depressions and translucent internal structures. Insemination ducts long and coiled, distally more sclerotised, spermathecae in the form of parallel central channels, fertilisation ducts distinctive, epigynal pockets located posteriorly—close to the epigastric furrow. Dimensions: CL 1.92, EFL 0.78, AEW 1.03, PEW 1.14, CW 1.24, AL 2.57.

Distribution (Fig. 5). Known only from the type-locality in Western Australia.

Etymology. For Graham Milledge, Collection Manager, Arachnology Department, Australian Museum, Sydney—one of the collectors of the material studied.

ACKNOWLEDGMENTS. The material studied here was collected during biodiversity surveys conducted by the Australian Museum and was kindly made available by Mr G. Milledge. Dr M. Harvey and Ms J. Waldock (Western Australian Museum, Perth) sent specimens from Western Australia. M. Żabka's visit in Australia was made possible thanks to a Visiting Fellowship offered by the Australian Museum and through co-operation of the staff of the Arachnology Department. Prof. J. Prószyński (Warszawa, Poland) provided critical remarks on *Afraflacilla*.

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The Taxonomy and Distribution of the Spider Genus *Phryganoporus* Simon (Araneae: Amaurobioidea: Desidae)

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ABSTRACT. The widely distributed Australian desid spider genus, *Phryganoporus* Simon, is taxonomically reviewed and validated. *Phryganoporus nigrinus* is removed from synonymy with *P. candidus*, while *Amaurobius gausapatus, P. g. occidentalis* and *P. tubicola* are synonyms of *P. candidus*. The species recognised here belong to two clades, [*P. candidus* (L. Koch), *Phryganoporus vandiemeni* (Gray) n.comb.] and [*P. nigrinus* Simon, *P. davidleei* n.sp., *P. melanopygus* n.sp.]. These clades are distinguished by the possession of a divided or entire cribellum and genitalic characters. Distribution maps and notes on relationships are given.

GRAY, MICHAEL R., 2002. The taxonomy and distribution of the spider genus *Phryganoporus* Simon (Araneae: Amaurobioidea: Desidae). *Records of the Australian Museum* 54(3): 275–292.

Spiders of the genus *Phryganoporus* are cribellate web builders that are distributed throughout Australia. They build webs on low vegetation and their abundant white hair cover probably helps reduce body heating, particularly for spiders occupying exposed webs in semi-arid to arid regions.

While the species described here are typically solitary, one species, *P. candidus*, has a life cycle that is associated with both communal and solitary webs. *Phryganoporus candidus* has long been known for its communal "nest" building behaviour (Main, 1971). In past years the webbing of these spiders upon fruit tree foliage in the Riverina area of New South Wales was a cause of severe foliage matting, leaf fall and withering of limbs. Downes (1993 [*Badumna candida*] and 1994a,b [*Phryganoporus candidus*]) has made a detailed study of the biology of *P. candidus* in southern Queensland. He classifies the species as a periodic-social group in which spiders disperse from the parental nest as subadult females and adult males. Most webs were founded in late summer by solitary subadult females. By October–November, at the peak of colony growth, each nest had about 100 spiders, along with an associated arthropod fauna of opportunist scavengers and predators. Most non-territorial, communal interaction (collective nest construction and cleaning, prey capture and feeding) took place between individuals below the subadult stage. Such communal interaction is probably a consequence of pheromone mediated sibling tolerance and is not regarded as true cooperative behaviour. Subadults males and females are less tolerant of each other. The faster maturing females dispersed over summer, most as subadults. Adult males did not appear in the nest until most of the females had dispersed. By March, the old nests were largely unoccupied.

Simon (1908) erected the genus *Phryganoporus* and included the following species from southern and western Australia: *Amaurobius gausapatus* Simon, 1906, *P. gausapatus occidentalis* Simon, 1908, *P. nigrinus* Simon, 1908 (all for female specimens) and *P. tubicola* Simon, 1908 (a male specimen). Roewer (1954) placed *Amaurobius candidus* L. Koch, 1872 (from Queensland) into *Ixeuticus* Dalmas and Hickman (1967) followed this transfer. Lehtinen (1967) synonymised *Ixeuticus* with *Badumna* Thorell but maintained *Phryganoporus* into which he placed

A. candidus (with *A. gausapatus* and *P. g. occidentalis* as synonyms) and *P. tubicola*. Main (1971) attempted to resolve the apparent taxonomic confusion by synonymising *Phryganoporus* with *Ixeuticus*, but recognised only one widely distributed species, *Ixeuticus candidus* (L. Koch). Gray (1983) synonymised *Phryganoporus* with *Badumna* as the *B. candida* species group made up of three species—*B. candida* (with *P. gausapata occidentalis, P. tubicola* and *P. nigrinus* as synonyms), *B. gausapata* and *B. vandiemeni* Gray.

The results of electrophoretic studies by Colgan & Gray (1992) and more recent morphological examination of new material has prompted a reassessment of the status of *Phryganoporus* and its associated species.

Materials and methods

Specimen examinations, measurements (in millimetres) and drawings were made using a Wild M5 microscope with graticule and drawing attachment. Epigynal preparations were cleared in 8% potassium hydroxide before mounting in glycerol for microscopic examination and drawing of the dorsal view of the internal genitalia. Specimen preparations for scanning electron microscopy were air dried from 100% acetone.

Abbreviations

Morphology BL, body length; CL carapace length; CW carapace width; LL, labium length; LW, labium width; SL, sternum length; SW, sternum width; ALS, anterior lateral spinnerets; PMS, posterior median spinnerets; PLS, posterior lateral spinnerets; RTA, retrolateral tibial apophysis.

Repository institutions AMS, Australian Museum, Sydney (specimens listed under accession numbers prefixed KS are deposited in the AMS); ANIC, Australian National Insect Collection, Canberra; MNHN, Museum National d'Histoire Naturelle, Paris; NMV, Museum of Victoria, Melbourne; QM, Queensland Museum, Brisbane; SAM, South Australian Museum, Adelaide; TM, Tasmanian Museum and Art Gallery, Hobart; WAM, Western Australian Museum, Perth; ZMH, Zoologisches Museum, Hamburg.

Collectors M.R. Gray, MRG; B. Guerin, BG; V.V. Hickman, VVH; D. Hirst, DH; C. Horseman, CH; A.E. de Jong, AEJ; D.C. Lee, DCL; G.A. Milledge, GAM; H.M. Smith, HMS; J. Thompson, JT.

Unsexed juvenile specimens are abbreviated *j*.

Taxonomy

Family Desidae

Genus *Phryganoporus* Simon

Phryganoporus Simon, 1908: 367 (type species *Amaurobius gausapatus* Simon, 1906). Roewer, 1954: 1370. Lehtinen, 1967: 259, 324.

Ixeuticus (part).–Main, 1971: 119. Brignoli, 1983: 495.

Badumna (part).–Gray, 1983: 248.

Diagnosis. Cribellate spiders. Body silvery grey to brown with light and dark brown patterning on abdomen. In solitary or communal webs. Separated from *Badumna* by the strong presence of white setae on the body; the possession on the male palp of a large, prolaterally directed, basal tegular bulge; extension of the conductor fold across to the retrolateral side of the bulb; and a basal RTA. From *Forsterina* and *Reinga* by the prolateral origin of the embolus and the presence of a transverse epigynal ridge. From *Namandia* by the sinuous course of the embolus across the ventral bulb and the presence of fused paracribellar spigots on the PMS; and from *Paramatachia* by these characters plus the presence of a median apophysis.

Description. Medium-sized cribellate spiders (CL 1.9–4.8) that live in solitary and communal sheet webs and run on top of the sheet. Overall colouration varies from silvery grey to brown, depending on the density of white hairs present (juveniles are often lighter in colour than adults). Body setae plumose, comprising shorter, broader, more recumbent hairs, and longer bristle-like hairs (Fig. 1f). Legs with several "plumose" setal types (Fig. 1a–c,i,j); long, vertical, plumose hairs sparsely scattered on lateral and dorsal surfaces. Feathery hairs absent. Carapace cuticle dark brown with a cover of white plumose hairs, giving a silvery grey to brown appearance (older specimens can appear browner through loss of hairs, cf. Fig. 3d). Chelicerae dark brown. Labium and maxillae dark brown with pale apices. Sternum silvery grey to brown, white hairs numerous to few. Abdomen light silvery grey to brown, anterior dorsum usually with a short, dark brown, mid-dorsal stripe, often delimited by a border of white hairs. Posterior dorsum with variable patterns of light and dark brown chevrons that may be more or less fused posteriorly, often with lateral tufts of white hairs. Lateral abdomen with brown flecks, often coalescing into a pair of irregular, longitudinal, brown stripes bordering the venter. Ventral abdomen with a light to dark grey-brown mid-ventral stripe (often enclosing paler patches) flanked by lateral white-pigmented stripes. Spinnerets brown. Legs light brown with darker brown pigment rings often giving a banded appearance. Caput prominent, gently arched; carapace highest near mid-caput. Eyes in two rows, anterior eye row slightly recurved, posterior eye row straight to moderately procurved; AME or ALE largest, lateral eyes slightly protuberant. Tapeta of indirect eyes canoe-shaped. Clypeus low, less than twice as wide as AME. Chilum divided. Chelicerae robust, with boss, fang with serrate retroventral margin; teeth 2–4 retromarginal, 3–5 promarginal; 4–5 moderately long modified setae on retromargin near fang base, about 15 along promargin, longest apically. Maxillae broad, lateral margins more or less convex. Labium short and wide, bluntly coniform, with short basal notches. Sternum longer than wide with a short extension between coxae IV. Legs 1243 or 1423. 3 tarsal claws, superior claws with 7–13 curved teeth, inferior claws with 2–3 teeth. Claw tufts and scopulae absent. Trochanters shallowly notched. Trichobothria in single row on tarsi and metatarsi, rather short but lengthening distally, 5–6 on tarsus I, 4–5 on metatarsus I, 3–4 in short, subdistal row on tarsus and metatarsus IV; trichobothria present on tibiae and on palpal tarsus and cymbium; bothria collariform, proximal plates with fine, longitudinal ridges. Tarsal organ placed subdistally, distal to trichobothria; capsulate with small pyriform pore (Fig. 1a–e). Male palp. Tibia short and wide, with two retrolateral apophyses: an apical ventrad RTA, ventrally protuberant with a narrow, semi-translucent distal margin; and a basal dorsad RTA, robust and spine-like. Inner surface of basodorsal apophysis with 1–2 small trichobothria. Patella

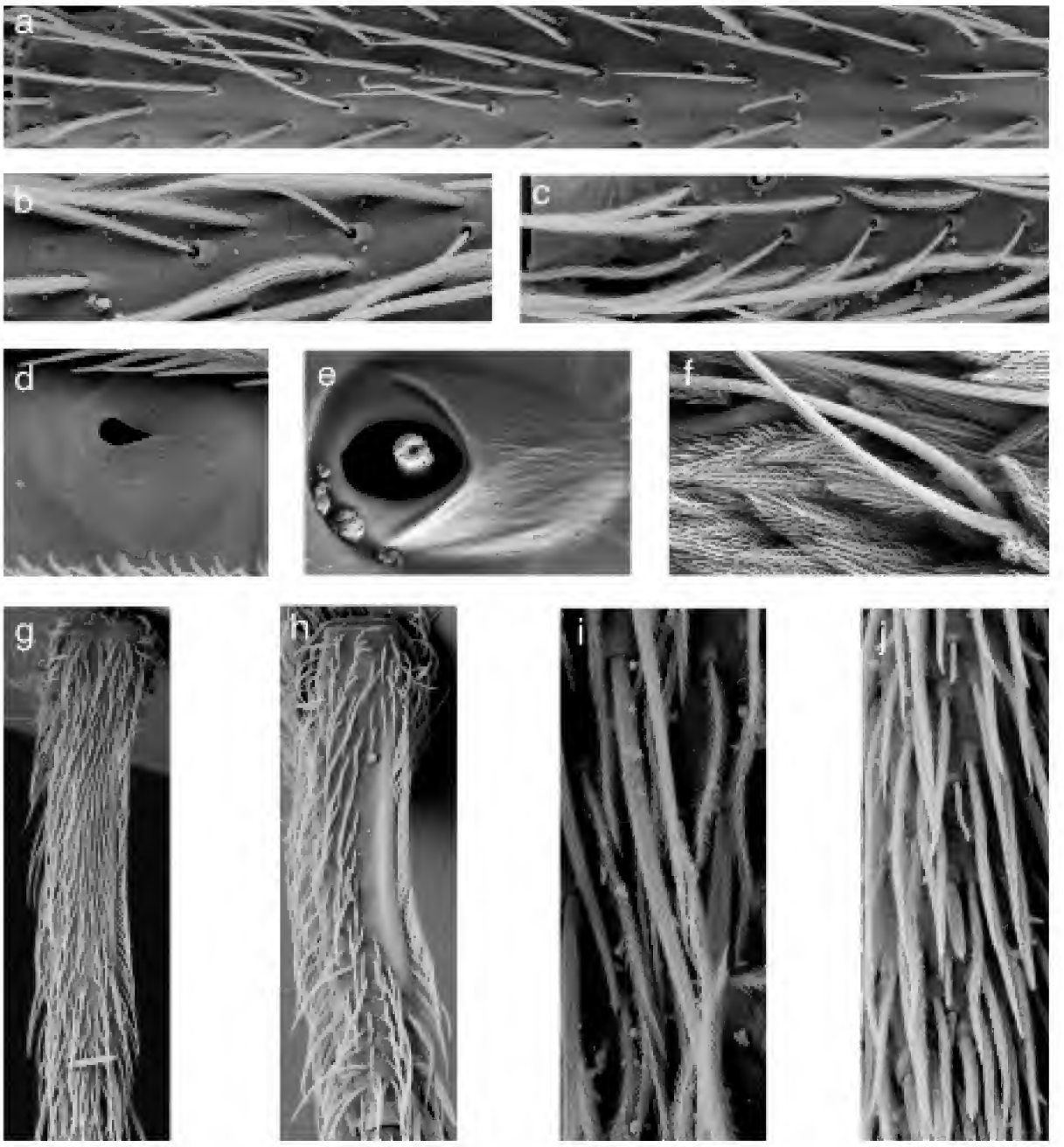

Figure 1. a,g, *Phryganoporus candidus*. b–f, h–j, *Phryganoporus nigrinus*. a,b, dorsal tarsi—tarsal organ and trichobothria: a, tarsus I; b, tarsus IV. c, trichobothria, metatarsus IV, dorsal. d,e, tarsus I: d, tarsal organ; e, distal bothrium. f, setae, dorsal abdomen. g,h, metatarsus IV and calamistrum, dorsal. i,j, leg setae, ventral: i, metatarsus; j, tarsus.

with retrodorsal bristle; retrodorsal patellar apophysis usually absent or rudimentary but sometimes well developed; spatulate white hairs present or absent. (Figs. 5e,g,l, 6f). Cymbium broad with short, broadly conical apex. Tegulum broad with a strong, prolaterally directed, basal tegular bulge. Tegulum and conductor ridged and moderately sclerotised. "S"-shaped, falciform conductor arises from the middle and prolateral tegulum; broadest basally, wrapping across the entire width of the bulb; marginally grooved and distally tapering (Fig. 5d,e,l). Embolus an elongate, sinuous rod, tapering near apex; arising prodorsally from the base of the tegulum, it curves ventrad over the tegular bulge and follows an "S" shaped course with the conductor across the ventral bulb. Median apophysis subapical, membraneous and spoon shaped, directed apically to retrolaterally (Fig. 6d–f). Epigynum with a deep, central fossa bounded posteriorly by a sclerotised transverse ridge of variable width; lateral teeth present, just posterolateral to transverse ridge (Figs. 5c, 7d). Internal genitalia with two wide, membraneous copulatory ducts leading to the paired spermathecae. Each spermatheca consists of a glandulate central lobe connected via a sclerotised interlobar duct of variable length to a small, sometimes indistinct, distal lobe (Figs. 5f, 6g). Spiracle opening anterior to and half as wide as cribellum (Fig. 2a,g). Tracheal system with four branched tubes confined to the abdomen. Calamistrum in central half to two-thirds of metatarsus IV in females, weakly developed in males.

Spinning organs (Fig. 2a–j, female). Cribellum entire or divided (Fig. 2f,j); spinning field(s) narrow; divided fields well separated (by about one fifth of a field width); males with non-functional, undivided cribellar plate, about three quarters width of functional cribellum. Spinnerets short; ALS broad, 2-segmented, each bordered anteriorly by a row of thick plumose hairs; PMS shortest, 1-segmented; PLS 2-segmented, as long as ALS with a coniform terminal segment. In female, ALS with 2 adjacent major ampullate gland spigots medially and about 35 piriform spigots; PMS with 1 minor ampullate, 1 cylindrical and 8 aciniform spigots, plus 4 fused paracribellar bases each with 5–14 spigots; PLS with c. 12 spigots, identified as 8 aciniform, 1–2 cylindrical, 1 modified PLS spigot (base truncate apically) with 2 associated paracribellar spigots, the base of the proximal spigot being partially or completely fused with the modified PLS spigot base (Fig. 2a–e,g–i).

Included species. *Phryganoporus candidus* (L. Koch), *Phryganoporus vandiemeni* (Gray) n.comb., *P. nigrinus* Simon, *P. davidleei* n.sp., *P. melanopygus* n.sp.

Notes on synonymies. *Phryganoporus* Simon is revalidated and removed from its synonymy with *Badumna* Thorell (Gray, 1983). *Phryganoporus nigrinus* Simon is removed from synonymy with *B. candida* (L. Koch). *Phryganoporus gausapatus* (Simon) is returned to synonymy with *P. candida*. *Phryganoporus g. gausapatus* Simon and *P. tubicola* Simon are retained in synonymy with *P. candida* (L. Koch).

Distribution. Australia and Norfolk Island.

Subgroups. Within *Phryganoporus*, two subgroups are recognised.

- *P. candidus–vandiemeni*: Cribellum divided (Fig. 2f). Basal segments of modified PLS spigot and proximal paracribellar spigot joined proximally (Fig. 2e). Calamistrum occupies central half to three-fifths of metatarsus IV (0.48–0.57:1), retrodorsal glabrous zone narrow, distal end of calamistrum usually delimited by a retrodorsal, subdistal spine (Fig. 1g). Transverse epigynal ridge usually broad, lateral teeth broadly pointed (Fig. 5c,h,j). Interlobar spermathecal ducts short, curving laterally to the distal spermathecal lobe (Fig. 5f,i,k). Male palp with central limb of the S-shaped embolus/conductor with a strong diagonal slope so that the upper section of the "S" is much smaller than the lower section (Fig. 5d). Patellar apophysis present, vestigial or absent (Fig. 5e,g,l).
- *P. davidleei–nigrinus–melanopygus*: Cribellum entire (Fig. 2j). Basal segments of modified PLS spigot and proximal paracribellar spigot completely fused (Fig. 2i). Calamistrum occupies central two-thirds of metatarsus IV (0.60–0.70:1), retrodorsal glabrous zone wide, subdistal delimiting spine absent (Fig. 1h). Transverse epigynal ridge usually slender (Figs. 6h, 7d). Interlobar spermathecal ducts elongate, acutely bent ("elbowed") laterally, doubling back to join the small, rounded distal spermathecal lobes (Fig. 6g). Male palp with the central limb of the S-shaped embolus/conductor horizontally oriented or gently sloping so that the upper section of the "S" is more than half the size of the lower section (Figs. 6d, 9a). Patellar apophysis absent (Fig. 6f).

Remarks

A previous electrophoretic study of the "*Badumna candida* species group" (Colgan & Gray, 1992) supported the validity of *Phryganoporus* Simon and the synonymy of *P. gausapatus* with *P. candidus*, as well as recognising several more or less distinct genetic populations. Of these, the two most distinct groups proved to be morphologically distinct and are given specific recognition here (*P. davidleei* n.sp., *P. melanopygus* n.sp.). All representatives of *B. vandiemeni* were consistently associated in analyses as a distinct basal or near basal clade within the main *candidus* group. Consequently, despite its close morphological similarity to *P. candidus, P. vandiemeni* is maintained here.

Spinnerets. Simon (1908) recorded the presence of an entire cribellum as a characteristic of his new genus *Phryganoporus*. This observation may have been based upon the female of *P. nigrinus* which he described at that time—the divided cribella of his *Amaurobius gausapata* and *P. gausapata occidentalis* females perhaps going unnoticed. Main (1971) noted the presence of a divided cribellum in her concept of *Ixeuticus candidus*. In fact, as demonstrated here, *Phryganoporus* possesses both entire and divided cribellum states (Fig. 2f,j). These states are correlated with differences in metatarsus IV and calamistrum structure (Fig. 1g,h). Given that the immediate outgroups of *Phryganoporus* (*Badumna, Forsterina*) have divided cribellum plates, the direction of change here appears to be from the divided to the entire state. Bond & Opell (1997) also record the presence of both cribellar states in the American dictynid genus *Mallos*. In dictynid spiders, including *Mallos*, the cribellum is typically entire. However, divided cribella characterise representatives of a derived clade in *Mallos*, within which two sister species show reversion to the entire state. The polarity of cribellar state changes are of considerable phylogenetic interest. The "entire" state seen in the basal araneomorphs (hypochilids and austrochiloids) is considered plesiomorphic for the group, while the basal groups of the Haplogynae and Entelegynae (Filistatidae and Eresoidea) show the derived "divided" state (Griswold *et al.*, 1999). Ramirez (2000) makes the interesting observation that the early instars of the austrochiloid spider *Thaida peculiaris* have a "bilobate cribellum". The possibility that this reflects the presence of a divided cribellum state in an ancestral austrochiloid remains open.

The presence of a "modified PLS spigot" and associated paracribellar spigots has been noted in many cribellate entelegyne araneomorphs by Griswold *et al.* (1999). Griswold (1990) noted that the large modified PLS spigot has a cylindrical but apically tapered base and a cylindrical distal section. In *Phryganoporus* the base is cylindrical and widely truncate apically, with a distal section that is more or less cylindrical in *P. candidus* and weakly clavate in *P. nigrinus*. Additionally the bases of the modified PLS spigot and the proximal paracribellar spigot are basally fused in *P. candidus* and completely fused in *P. nigrinus*. The pattern seen in *P. candidus* is also present in *Badumna* spp. The fusion of these spigots, as well as their proximity, indicates a close functional relationship.

Relationships. *Phryganoporus* is most closely associated with the *Badumna–Forsterina* ("badumnine") generic group which is characterised by the sinuous ("S or E-shaped") course of the conductor and embolus across the bulb; and

Figure 2. a–j, spinnerets (female). a–f, *Phryganoporus candidus*: a, spinneret field; b, ALS; c, PMS; d, PLS; e, modified PLS and paracribellar spigots; f, cribellum. g–j, *Phryganoporus nigrinus*: g, spinneret field; h, PMS; i, modified PLS and paracribellar spigots; j, cribellum.

less closely with the *Namandia–Matachia* ("namandiine") generic group, which shares with the previous group the "spoon-shaped" membranous median apophysis (or derivative hook-like form or absent), the plate-like (or derivative form) apicoventral RTA and the almost universal presence of epigynal teeth. Morphological trends in *Namandia* support the derivation of the sinuous embolus/conductor conformation typical of the "badumnine" group from the circular to semicircular-falciform conformation typical of the "namandiine" group. The PMS of genera representing these generic groups differ considerably. In *Phryganoporus, Badumna* and *Forsterina* the paracribellar spigot bases are fused while in *Namandia, Matachia* and *Paramatachia* they are free, the presumed plesiomorphic condition.

Like *Matachia*, many New Zealand genera placed in the Desinae of Forster (1970) and the Amphinectidae of Forster & Wilton (1973) can be associated with these generic groups. For example, almost all of Forster's desine genera, exemplified by *Matachia, Goyenia, Panoa* and *Manawa*, can be related to the "namandiine" group on the basis of palpal (and spinneret) conformation. Of the New Zealand amphinectids, *Reinga* fits within the "badumnine" group near *Forsterina* (E-shaped embolus with retrolateral origin) while *Mamoea* also has "badumnine" affinities (S-shaped embolus with prolateral origin). "Amphinectid-desine" associations have also been suggested by Griswold *et al.* (1999) and Davies & Lambkin (2000).

The placement of *Phryganoporus* here with the Desidae remains provisional. *Badumna* (syn. *Ixeuticus*) has been variously associated with the Desidae or Desinae by Lehtinen (1967), Forster (1970) and Griswold *et al.* (1999). The nominal genus, *Desis*, is a highly derived taxon whose relationships are unclear. Some of the distinctive characters of *Desis* include the greatly increased size of the spigot field on the posterior median spinnerets, a double row of trichobothria on the tarsi, apically tapered maxillae, absence of a serrula. Others, like the strongly porrect jaws (also seen in "namandiine" groups and more widely) and reduction of leg spines could be simply specialisations related to living and feeding in an intertidal habitat. The general morphology of the male palp is rather similar to the "namandiine" pattern noted above, but the presence of a "secondary tegular process" is an important difference. Davies (1998) has suggested that this could represent the "primary" conductor (sensu Lehtinen, 1967) whose function has been taken over by the larger falciform "secondary" conductor. This raises doubts over the homology of the functional conductors in *Desis* and the "badumnine" and "namandiine" groups. All of this suggests that these groups cannot be readily associated with *Desis* or the Desinae.

Key to species of *Phryganoporus*

Females

1 Cribellum divided. Calamistrum about half as long as metatarsus. Interlobar spermathecal ducts relatively short (observed by depressing the posterior margin of the epigastric groove) 2

—— Cribellum entire. Calamistrum about three-quarters length of metatarsus. Interlobar spermathecal ducts elongate and acutely elbowed laterally 3

2 Distal spermathecal lobes longitudinally ovoid; distal end of interlobar duct bends sharply anterolaterally to join distal lobe. In solitary webs. Tasmania and far southeast coastal mainland ..... *P. vandiemeni*

—— Distal spermathecal lobes usually rounded. Distal end of interlobar duct curves laterally to join distal spermathecal lobe. In solitary or communal webs. Mainland Australia ..... *P. candidus*

3 Abdominal chevrons not fused posteriorly, sometimes indistinct ..... *P. davidleei*

—— Abdominal chevrons fused posteriorly forming a dark patch on the end of the abdomen 4

4 Body narrow, more or less cylindrical in shape. Abdomen with 2–3 chevrons and a dark brown, dorsal patch on end of abdomen (eastern populations may be less strongly pigmented) ..... *P. nigrinus*

—— Body less cylindrical. Abdomen with 1–2 chevrons, posterior third dark brown ..... *P. melanopygus*

Males

1 Central limb of of S-shaped embolus/conductor strongly angled, diagonal 2

—— Central limb of S-shaped embolus/conductor horizontal or only weakly angled 3

2 Male palp with patellar apophysis and associated white spatulate hairs. In solitary webs. Tasmania and far southeast coastal mainland ..... *P. vandiemeni*

—— Male palp usually without obvious patellar apophysis. In solitary or communal webs. Mainland Australia ..... *P. candidus*

3 Abdominal chevrons not fused posteriorly, sometimes indistinct ..... *P. davidleei*

—— Abdominal chevrons fused posteriorly forming a dark patch on the end of the abdomen 4

4 Central limb of S-shaped conductor horizontal. Body narrow, more or less cylindrical in shape. Abdomen with 2–3 chevrons and a dark brown, dorsal patch on end of abdomen (eastern populations may be less strongly pigmented) ..... *P. nigrinus*

—— Central limb of S-shaped conductor weakly angled. Body less cylindrical. Abdomen with 1–2 chevrons, posterior third dark brown ..... *P. melanopygus*

Phryganoporus candidus (L. Koch)

Figs. 1a,g, 2a–f, 3a,b, 4a, 5a–i

Amaurobius candidus L. Koch, 1872: 333, pl.25, fig. 6. Holotype female from Bowen, Queensland, Australia (ZMH, Araneae type catalogue no. 11, Museum Godeffroy, Hamburg, catalogue no. 7852—examined).

Amaurobius gausapatus Simon, 1906: 295.

Phryganoporus gausapatus.–Simon, 1908: 367. Lehtinen, 1967: 259, fig. 102.

Phryganoporus gausapatus occidentalis Simon, 1908: 367. Main & Harvey, 1992: 708.

Phryganoporus tubicola Simon, 1908: 367, fig. 1. Lehtinen, 1967: 259, fig. 109. Main & Harvey, 1992: 708.

Ixeuticus candidus.–Roewer, 1954: 1388. Hickman, 1967: 33, fig. 50, 51 [= *P. vandiemeni* (Gray)]. Leech, 1972: 26. Main, 1971: 119. (Not Dondale, 1966: 1188, fig. 9a–e [= *Badumna* sp.]).

Phryganoporus candidus.–Lehtinen, 1967: 259.

Badumna gausapata.–Gray, 1983: 254, fig. 12–18. Platnick, 1989: 408; 1997: 629.

Badumna candida.–Gray, 1983: 250, fig. 1–11. Platnick, 1989: 408; 1993: 536; 1997: 629. Colgan & Gray, 1992: 86.

Material examined. NEW SOUTH WALES: 4♀, KS6006, Wee Jasper, on Carey's Rd, 35°07'S 148°41'E, 30 Oct 1980, MRG; from solitary webs on dead thistle heads. 1♀, KS6088, data as for KS6006. 23♂, 1♀, 2*j*, KS6089, 6.5 km E of Dubbo, 32°14'S 149°10'E, 21 Aug 1980, MRG & CH; communal web. 1♀, KS6936, 21 km E of Parkes, 33°08'S 148°11'E, 8 Apr 1972, MRG; solitary web. 6♂, 4♀, KS6937, Baradna Downs, Wanaaring, 29°42'S 144°09'E, 28 Mar 1977; on hop bush. 1♀, KS6940, Round Hill, 32°59'S 146°09'E, 1 Aug 1968, MRG. 1♀, KS6979, data as for KS6940, 5 Aug 1968; web on spinifex. 1♀, KS6982, Bourke area, 30°05'S 145°56'E. 1♀, KS7852, Warrumbungle National Park, 31°19'S 148°59'E, 1 Feb 1969, MRG. 3♀, KS15958, Mildura, 34°11'S 142°10'E, 17 Dec 1978, MRG; communal nests on mallee. 21♂, 8♀, KS16731, Hay-Grenfell area, 34°24'S 146°46'E, 12 May 1986, MRG. 1♂, 1♀, KS16732, 20 km W of Grenfell, 33°20'S 147°55'E, 13 May 1986, MRG; web on eucalypt. 1♂, KS16733, 60 km E of Hay, 34°29'S 145°29'E, 10 May 1986, MRG; web on wattle. 1♂, 1♀, KS17161, 2 km E of Gunbar, 34°04'S 145°25'E, 24 Apr 1987, MRG; 26 spiders in communal nest on eucalypt. 1♂, 1♀, KS17162 (data as for KS17161); 71 spiders. 1♂, 1♀, KS17163 (data as for KS17161); 46 spiders. 2♂, 1♀, KS17164 (data as for KS17161); 100 spiders. 1♀, KS17452, Goonoo State Forest, NW corner near "Ultimo" Station, 32°03'S 148°55'E, 17 Sep 1987, CH & A. Johnson; solitary nest with egg sac. 1♂, KS17453; 1♂, 2*j*, KS17454; 1♀, KS17455; Goonoo State Forest, NE corner N of junction of Breelong & Denmire Rds, 32°03'S 148°55'E, 18 Sep 1987, CH & A. Johnson. 1♀, KS17457, Goonoo State Forest, SW corner, junction of Freemans & Western Boundary Rds, 32°03'S 148°55'E, 18 Sep 1987, CH & A. Johnson. 7*4j*, KS17460, south of Neville on Kentucky Rd, "Springerlee" Station gate, 33°45'S 149°12'E, 19 Sep 1987, CH & A. Johnson. 1♀, KS17822, Lake Munmorah State Recreation Reserve, Geebung, 33°13'S 151°34'E, 30 Oct 1987, MRG; from communal web (used for electrophoretic study). 1♀, KS32719, Newtown, 33°37'S 150°48'E, March 1928, F. Plant. 1♀, KS32720, Jenolan Caves, 33°49'S 150°02'E, 28 Nov 1901, V. Wiburd. 1♀, KS43641, 5 km W of Kiacatoo, 33°02'S 146°49'E, 21 Sep 1994, MRG; nest with juveniles on riparian eucalypt. 1♀, KS43642, 7 km W of Parkes, 33°06'S 148°07'E, 21 Sep 1994, MRG; solitary nest on *Callitris*. 1♀, 1*j*, KS43643, 10 km NW of Wagga Wagga on Coolamon Road, 35°03'S 147°22'E, 23 Sep 1994, MRG. 1♀, KS43661, 36 km SW of Bingara on Narrabri Rd, Glacial Area Historical Site, 30°03'S 150°17'E, 5 Oct 1994, JT; from solitary nest in open eucalypt/*Callitris* forest. 3♂, 1♀, KS43662, data as for KS43661; in communal nest. 2♀, N1992202–3 (SAM), Broken Hill, 31°58'S 141°27'E, 12 Jul 1980, DH. 1♂, 2♀, N1992182–4 (SAM), Menindee Lakes, 32°20'S 142°20'E, 11 Apr 1981, DH. AUSTRALIAN CAPITAL TERRITORY: 1♀, KS6087, Black Mountain, Canberra, 35°17'S 149°13'E, 1 Oct 1980, MRG; solitary web, egg sac with 29 eggs. 1♀, KS6090, Black Mountain, Canberra, 35°17'S 149°13'E, 1 Nov 1980, MRG; from communal web. 4♀, KS6086, data as for KS6090; from communal web, 4 egg sacs with 13, 49, 22 and 39 eggs. 5♂, KS6942, Canberra, 35°17'S 149°13'E, 24 May 1965, M.S. Upton; collected from ANIC light trap. 1♀, 2*j*, KS17153, Black Mountain, Canberra, 35°16'S 149°06'E, 25 Apr 1987, MRG; 4*8j* in nest. VICTORIA: 40♂, 23♀, 8*j*, KS17177, 18 km W of Mildura, 34°14'S 141°58'E, 24 Apr 1987, MRG; part of large communal nest of 558 individuals on mallee eucalypt by roadside. 10♂, 3♀, 12*j*, KS17154 (data as for KS17177); nest with 150 specimens. 2♂, 2♀, 4*j*, KS17155 (data as for KS17177); 106 specimens in nest. 8♂, 9♀, 8*j*, KS17156 (data as for KS17177); 172 specimens in nest. 16♀, KS31601–4, 17 km NE of Euroa, 36°39'S 145°43'E, 25 Oct 1990, MRG; from solitary nests on shrubs. 6♀, KS34441, data as for KS31601–4. 2♀, KS31605, 2 km E of Rushworth, on Murchison road, 36°36'S 145°02'E, 13 Feb 1991, CH & JT; web on spiky shrub. 1♂, (NMV), 16.2 km SE of Murrayville, 35°22'S 141°19'E, June 1986, A.L. Yen. 1♂, KS45064, Nunawading, 37°49'S 145°11'E, 10 Jun 1956, A. Neboiss. 2♀, N1992192–3 (SAM), Harriers Swamp Holey Plains State Park, 38°14'S 146°56'E, 16 Jun 1989, DH. 1♂, N1992204 (SAM), Red Cliffs, 1978, DH. NORTHERN TERRITORY: 2♀, KS55828, Watarrka National Park, King's Canyon, 24°15'S 131°31'E, 16 May 1999, MRG, GAM & HS. 1♀, KS55829, Uluru National Park, Ranger accommodation area, 25°21'16"S 131°04'11"E, 14 May 1999, MRG, GAM & HS; on prickly *Acacia*. 1♀, KS55830, Watarrka National Park, Kathleen Springs, 24°20'38"S 131°40'54"E, 15 May 1999, MRG, GAM & HS. SOUTH AUSTRALIA: 1♂, 8♀, 10*j*, KS8663, Kimba, Eyre Peninsula, 33°08'S 136°25'E, 30 Mar 1978, B.Y. Main. 9♂, 6♀, 1*j*, KS16925, Acraman Ck, Eyre Peninsula, track E of Smoky Bay, 32°23'S 133°56'E, 7 May 1986, B.Y. Main; communal nest on mallee eucalypt. 1♂, 1♀, KS17157, 33 km W of Iron Knob, 32°07'S 136°50'E, 24 Apr 1987, MRG; 41 specimens in communal web on mallee eucalypt. 2♂, 1♀, KS17158 (data as for KS17157); 37 specimens in communal web. 2♂, 1♀, KS17159 (data as for KS17157). 1♂, 2♀, 3*j*, KS17160 (data as for KS17157); 22 specimens in communal web. 1♀, *j*, KS34473, Nullarbor Plain nr Catacombs Cave (5N), 31°08'S 130°37'E, 10 Jul 1991, MRG; solitary web on *Acacia*. 5♀, 3*j*, KS34474, data as for KS34473; solitary tubular retreat web on samphire. 1♀, KS34475, Nullarbor Plain, grid ref 663.8 6527, 11 Jul 1991, MRG; nest on *Acacia* shrub in cave doline. 1♀, KS55827, Orroroo, at Giant Red Gum, 32°44'S 138°37'E, 10 May 1999, MRG, GAM & HMS. ♀♀, *j*, N1991281 (SAM), 4 km SW of Emu, 28°35'S 132°10'E, 6 Oct 1976, DCL; communal nest on sandhill *Acacia*. 1♀, *j*, N1991282 (SAM), 13 km E of Ooldea, 30°28'S 131°58'E, 30 Sep 1988, DH; on low mallee. 6♀, N1991283–8 (SAM), 13 km E of Ooldea, 30°28'S 131°58'E, 30 Sep 1988, DH. 1♀, N1991289 (SAM), Lake Meramangye, near SW corner, 28°29'S 132°08'E, 6 Oct 1976, DCL; in communal web on *Acacia*. 1♀, N1991290 (SAM), 5 km E of Gibraltar Rocks, 30°26'S 134°31'E, 2 Oct 1976, DCL; on *Melaleuca*. 1♀, N1991291 (SAM), Yardea Homestead, 32°23'S 135°31'E, 25 Sep 1988, DH. 1♀, N1991292 (SAM), Gawler Ranges, 34°36'S 138°45'E, October 1985, NPWS Survey. 1♀, *j*, N1991293 (SAM), Kolay Hut, 32°33'S 135°36'E, 9 Dec 1989, DH. 1♀, N1991294–5 (SAM), Kulliparu Conservation Park, SW corner (NW cnr Courtabie lease), 33°08'S

134°49'E, Sep 1990, S. Lewer & R. Brundle. 1♂, 1♀, N1991296–7 (SAM), Mt Wedge, 1 km NW of summit, 33°29'S 135°09'E, 31 Mar 1987, DCL & DH; in solitary webs on dead mallee. 10♂, 13♀, N1991298–320 (SAM), Mt Wedge summit, Eyre Peninsula, 33°29'S 135°09'E, 31 Mar 1987; communal nest on mallee. 3♀, 54*j*, N1991321–3 (SAM), data as for N1991298–320. 10♀, 5*j*, N1991324–33 (SAM), Carrappee Hill Conservation Park, 2 Apr 1987, DCL & DH; in communal web on mallee. 1♀, 8*j*, N1991334 (SAM), Hinks Conservation Park SE Boundary, 25 Mar 1987, DCL & DH; in communal web. 1♂, N1991335 (SAM), Lake Gilles Conservation Park, 32°38'S 136°53'E, 2 Apr 1987, DCL & DH; solitary web on dead mallee. 1♀, N1991336 (SAM), Pinkawillinie Conservation Park, 33°07'S 136°00'E, 18–19 May 1990, DH. 1♂, 1♀, *j*, N1991337–9 (SAM), Nacooma Station 35 km N of Port Augusta, 32°13'S 137°52'E, 10 May 1982, G. Traice; web on saltbush. 1♂, 3♀, 1*j*, N1991340–4 (SAM), 2–3 km W of Lake Frome, 30°44'S 139°46'E, 10 May 1989, J.A. Forrest & DCL. 1♀, N1991345 (SAM), Melrose camping area, 32°50'S 138°11'E, 18 Apr 1987, DH. 3♂, 1♀, 6*j*, N1991346–9 (SAM), Bald Hill Beach near Port Wakefield, 34°11'S 138°09'E, 11 Feb 1989, B. McMahon. 1♀, *j*, N1991352–5 (SAM), 4 km from Ferries-McDonald National Park on Strathally Rd, 35°13'S 139°09'E, 24 Nov 1980, G. Coombs; communal nest on eucalypt. 7♀, N1992129–136 (SAM), S of Middleback Station, 32°57'S 137°23'E, June 1984, BG; "web cases" in solitary webs on *Callitris, Lignum, Scaevola*, myall, *Lycium*. 1♂, N1992200 (SAM), Middleback Station Vagrantin Shearer's Kitchen, 32°57'S 137°23'E, June 1984, BG. 1♂, N1992201 (SAM), South Middleback Ranges, 33°14'S 137°07'E, 6 Jul 1984, BG. 4♀, 1*j*, N1992151–5 (SAM), Hambridge Conservation Park, 33°27'S 135°56'E, April 1984, BG. 14♀, N1992157–70 (SAM), Nappyalla, 35°26'S 139°07'E, October 1991, J. Eckert. 1♀, N1992171 (SAM), 13 km N of Keilira Station, 36°37'S 140°11'E, 10 May 1968, DH. 1♀, N1992185 (SAM), Appreentinna Ck, 27°48'S 134°09'E, 21 May 1981, DH. 1♀, N1992186–9 (SAM), Port Augusta, 32°30'S 137°46'E, 23–25 Jan 1987, DH; coastal sand dune habitat. QUEENSLAND: 3♂, 4♀, 2*j*, KS42443, 45 km S of Charters Towers, 20°29'S 146°14'E, 24 Apr 1994, M. Moulds & JT; from communal nest in *Acacia* tree. 1♀, KS43576, Forty Mile Scrub 1 km from Mt Surprise turnoff, 18°05'S 144°53'E, 12 Apr 1994, JT, M. Moulds, F. MacKillop; communal web on spiky dead bush. 2♀, KS43646, McLeod R. crossing beside highway, 16°30'S 145°00'E, 16 Apr 1994, JT, M. Moulds, F. Mackillop. 1♀, KS43647, Annan R. crossing beside highway, 15°41'S 145°12'E, 16 Apr 1994, JT, M. Moulds, F. Mackillop. 1♀, KS43717, 57 km E of Croydon, 18°14'S 142°42'E, 29 Jul 1995, JT, M. Moulds; communal web in bottlebrush shrub. 1♀, KS43930, Mackenzie R., Dingo Road crossing, 23°04'S 149°03'E, 2 Aug 1995, M. Moulds, M. Tio. 2♂, 10♀, 1*j*, KS43974, Mackenzie R., Dingo Rd Crossing, 23°04'S 149°03'E, 2 Aug 1995, M. Moulds, M. Tio. 1♀, KS43975, between Carnarvon Gorge turn-off & Rolleston, on Highway, 24°53'S 148°31'E, 8 Jul 1995, JT, M. Tio, S. Cowan; solitary web, on spiky *Acacia*. 3♂, 2♀, 1*j*, KS44157, Drummond Range Lookout, 23°39'S 147°12'E, 8 Jul 1995, JT, M. Tio, S. Cowan; communal web. 2♀, KS44160, 95 km S of Rolleston on highway to Injune, 25°14'S 148°37'E, 6 Jul 1995, JT, M. Tio, S. Cowan; web on spiky bushes. 2♀, KS44162, 80 km NW of Winton on (station) road to Cloncurry, 21°56'S 142°32'E, 10 Jul 1995, JT, M. Tio, S. Cowan; in communal web. 2♀, KS44163, NW of Winton on highway, 22°12'S 142°53'E, 10 Jul 1995, JT, M. Tio, S. Cowan; communal web. 1♀, KS44165, Chillagoe National Park outside Royal Arch Cave, 17°11'S 144°29'E, 16 Jul 1995, JT, M. Tio, S. Cowan; in communal web. 1♀, KS44166, Undara National Park, 18°12'S 144°34'E, 29 Jul 1995, JT, M. Tio, S. Cowan; communal web. 1♀, KS44171, 19 km S of Burke & Wills Roadhouse on highway to Normanton, 19°20'S 140°15'E, 12 Jul 1995, JT; in communal webs. 1♀, 2*j*, KS44172, 62 km W of Chillagoe, Burke Development Rd, 16°44'S 144°05'E, 15 Jul 1995, JT, S. Cowan; communal web. 1♀, 3*j*, KS44173, 5 km S of Normanton, 17°46'S 141°01'E, 12 Jul 1995 JT, S. Cowan; from communal web. 1♂, KS44174, 30 km S of St. George, beside highway to Mungindi, 28°12'S 148°44'E, 02 Aug 1995, JT; communal web in small *Acacia*. 1♀, 3*j*, KS44190, 95 km S of Injune on highway to Rolleston, 25°14'S 148°37'E, 06 Jul 1995, JT, M. Tio, S. Cowan; web on spiky bushes. 1♀, KS44191, 20 km N of Cloncurry, 20°33'S 140°25'E, 11 Jul 1995, JT; from communal web on dead *Acacia* tree. 1♀, KS44192, N of Hann R. on highway to Coen, 15°02'S 143°40'E, 18 Jul 1995, JT, J. Olive. 3♀, 2*j*, KS44193, Belmore Ck, 10 km W of Croydon, 18°02'S 141°58'E, 29 Jul 1995, JT, M. Moulds; communal webs on *Acacia*. 1♀, 1*j*, KS44194, 25 km NE of the Lynd, 18°42'S 144°40'E, 30 Jul 1995, JT; on *Acacia*. 1♀, KS44195, Croll Ck N of Coen, 13°40'S 143°04'E, 18 Jul 1995, JT, M. Moulds, M. Tio, F. MacKillop, J. Olive; in communal web. 1♂, KS44843, on track to Moss Garden, 25°03'S 148°12'E, 07 Jul 1995, JT, M. Moulds; solitary web on dead thistle. 8♂, 7♀, 6*j*, KS45063, JCU Campus, Townsville, 19°16'S 146°49'E, 1986–89, M. Downes; from several nests. 1♀, KS45727, Silver Valley near Herberton, 17°20'S 145°17'E, 24 Sep 1950, J.S. Brookes. 3♂, 2♀, S141 (QM), Girraween National Park area, 28°50'S 151°55'E, 7 Apr 1974, R.J. Raven; on heath. 4♂, 2♀, 23*j*, S144 (QM), Southwood, 30 km W of Moonie, 27°46'S 150°04'E, 24 Aug 1973, R.J. Raven; communal web 35–40 cm diameter on *Hakea*. 4♂, 1♀, 3*j*, S15942 (QM), Kenniff Cave area Mt Moffatt, 25°01'S 147°57'E, 27 Sep 1986, M. Bennie. 10♀, 1*j* S20199 (QM), Chillagoe, 17°09'S 144°31'E, 24–27 Apr 1978, R.J. Raven & V.E. Davies. 5♂, 7♀, S20200 (QM), Eureka Ck, 17°11'S 145°01'E, 11 Feb 1972, N.C. Coleman. 1♂, 4♀, 1*j*, S20201 (QM), Wolfram, 17°05'S 144°57'E, 13 Feb 1972, N.C. Coleman. 1♂, 3♀, S20202, Mt Garnet, 17°41'S 145°06'E, 24 Feb 1972. 1♀, (QM), Kroombit Tops, 24°22'S 151°01'E. 1♀, (QM), Endfield (Mulga site), 23°46'S 151°16'E. 1♀, (QM), Moreton Island near Trench, 27°11'S 153°24'E. 1♀, (QM), Glenormiston, 22°55'S 138°48'E. 1♀, (QM), Mt Garnet, 17°41'S 145°07'E. 1♀, 2*j*, N1992172 (SAM), near Tiaro, 25°44'S 152°35'E, 25 May 1979, DH. WESTERN AUSTRALIA: 1♂, Ar.811 (MNHN), syntype of *Phryganoporus tubicola* Simon (examined), Denham, (Stat. 65). 2*j*, 11/4279, 4279a (WAM), syntypes of *P. tubicola* Simon (not seen, other data as for Ar.811). 1*j*, 11/4269 (WAM), syntype of *Phryganoporus gausapatus occidentalis* Simon, East Cannington (Stat. 125). 1♀, KS6938, Torbay Head, 35°08'S 117°38'E, 10 Oct 1977, MRG. 1♂, 4♀, KS6939, Brookton, 32°22'S 117°00'E, 5 May 1977, MRG. 1♀, KS6981, Perth, 31°57'S 115°51'E. 1♀, KS9986, Dryandra Forest near Narrogin (site 2(22)), 32°56'S 117°11'E, 29 Mar 1982, K. Brown. 1♀, KS9987, Dryandra Forest (site 2(15)), data as for KS9986. 1♂, 1♀, KS10252, Brookton, 32°22'S 117°00'E, 5 May 1977; on citrus tree. 1♀, KS17357, Anna Plains Station, 25 km N of Sandfly Flat, 19°15'S 121°29'E, 26 Jul 1987, B.Y. Main. 1♀, KS17358, Shark Bay, Denham, 25°56'S 113°32'E, 5 Jul 1987, B.Y. Main. 1♀, 59*j*, KS17447, Canning Stock Route, west of Well 41, 21°34'S 125°51'E, 8 Aug 1987, AEJ. 22*j*, KS17448, Canning Stock Route, at cairn approx. 20 km NE of Well 36, 22°00'S 125°07'E, 6 Aug 1987, AEJ. 72*j*, KS17449, Canning Stock Route, track to Well 37, 22°09'S 125°19'E, 6 Aug 1987, AEJ; on *Acacia*. 37*j*, KS17450, Canning Stock Route, near Well 31, 22°31'S 124°23'E, 4 Aug 1987, AEJ; on *Acacia*. 1♀, 91/1616 (WAM), Canning Stock Route, Well 6, 25°14'S 121°05'E, 22 Jul 1987, AEJ; from large nest on *Acacia*, several spiders seen. 1♀, 91/1617 (WAM), Canning Stock Route, nr Well 23, 23°05'S 123°12'E, 29 Jul 1987, AEJ. 1♀, 91/1618 (WAM), Canning Stock Route, nr Well 23, 23°05'S 123°12'E, 30 Jul 1987, AEJ. 4*j*, KS19007–10, Cape Bernier, Kimberley area, 15°39'S 128°42'E, 06 Jun 1988, A.R. Main. 1♀, KS19270, South Hedland, 20°26'S 118°36'E, 9 Aug 1988, P. Filmer-Sankey; ex *Acacia translucens*, communal nest. 4♀, KS23447, Collier Range National Park, 24°32'S 118°50'E, 14 Jul 1990, AEJ. 1♀, KS23449, Mellin Jerrie Well, Kidson Track, 21°01'S 123°20'E, 28 Jul 1990, AEJ. *j*, AMS (unregistered), Point Spring Nature Reserve, NNE of Kununurra, 15°24'37"S 128°52'58"E, 29 May 1999, MRG, GAM & HMS; communal web. 1♀, *j*, KS55831, Durack R. Crossing, Gibb R. Road, 15°56'S 127°13'E, 04 Jun 1999, MRG, GAM & HMS; communal web on foliage. 1♀, *j*, KS55832, data as KS55831. 1♂, 91/1611 (WAM), Belmont International Airport, Perth, along N fence off Kalamunda Road, 31°57'S 115°51'E, 20 Jan 1987, W.F. Humphreys; in tubular web. 1♀, 16*j*, 91/1620–37 (WAM), City Beach nr Rifle Range, 31°56'S 115°45'E, 21 Jun 1973, Mercedes College 3rd yr. 2♀, 1*j*, 91/1639–41 (WAM), Darlington, 31°54'S 116°04'E, May 1975–Mar 1976, G.H. Lowe. 1♂, 1♀, 91/1642–3 (WAM), Darlington, as for 91/1639–41, May 1977–Apr 1978. 1♀, J, 91/1647 (WAM), Durokoppin Nature Reserve, 31°30'S 117°44'E, 1 Mar 1988, D. Mitchell *et al*., beating. 1♂, 1♀, 91/1644–46 (WAM), as for 91/1647, 10 Dec 1987. 1♀, 91/1648 (WAM), Ferndale (suburb of Perth), 33°49'S 115°57'E, 18 Jan 1978, D. Connop; among grape vine leaves. 1♀, 91/1649 (WAM), 3.2 km E of Gin Gin, 26 Nov 1968, Hale School. 1♀, 91/1654 (WAM), Lyons R., 24°28'S 117°14'E, 29 Jul 1989, AEJ. 1♀, 91/1693 (WAM), Parmelia, 32°15'S 115°47'E, 26 Jan 1991, AEJ. 1♀, 91/1692 (WAM), 30 Dec 1989, as for 91/1693; on lemon tree. 1♀, 91/1694 (WAM), Tim Ealey Hill, 21°35'S 118°59'E, 21 Apr 1989, M.S. Harvey. 2♀, 92/108–9 (WAM), Bold Park, 31°56'S 115°46'E, 4 Feb 1987, W.F. Humphreys. 1♂, 1♀, 92/111–2 (WAM), as for 92/108–9, 10 Mar 1987. 1♀, N1992173–4 (SAM), Watheroo, 30°18'S 116°03'E, 29 Sep 1981, DH. TASMANIA: 3♂, Hickman Collection (AMS), Hobart, 42°50'S 147°15'E, VVH. NORFOLK ISLAND: 1♀, 3*j*, N1981239 (SAM), 29°05'S 168°00'E, December 1915 to January 1916, A.M. Lea.

Diagnosis. CL female 2.8–4.7, male 2.4–3.5. Cribellum divided. Separated from *P. vandiemeni* by distal spermathecal lobe usually rounded or transversely ovoid and interlobar duct not recurved distally. Male palp often without an obvious patellar apophysis. Late instar juveniles and adults found in communal and solitary webs.

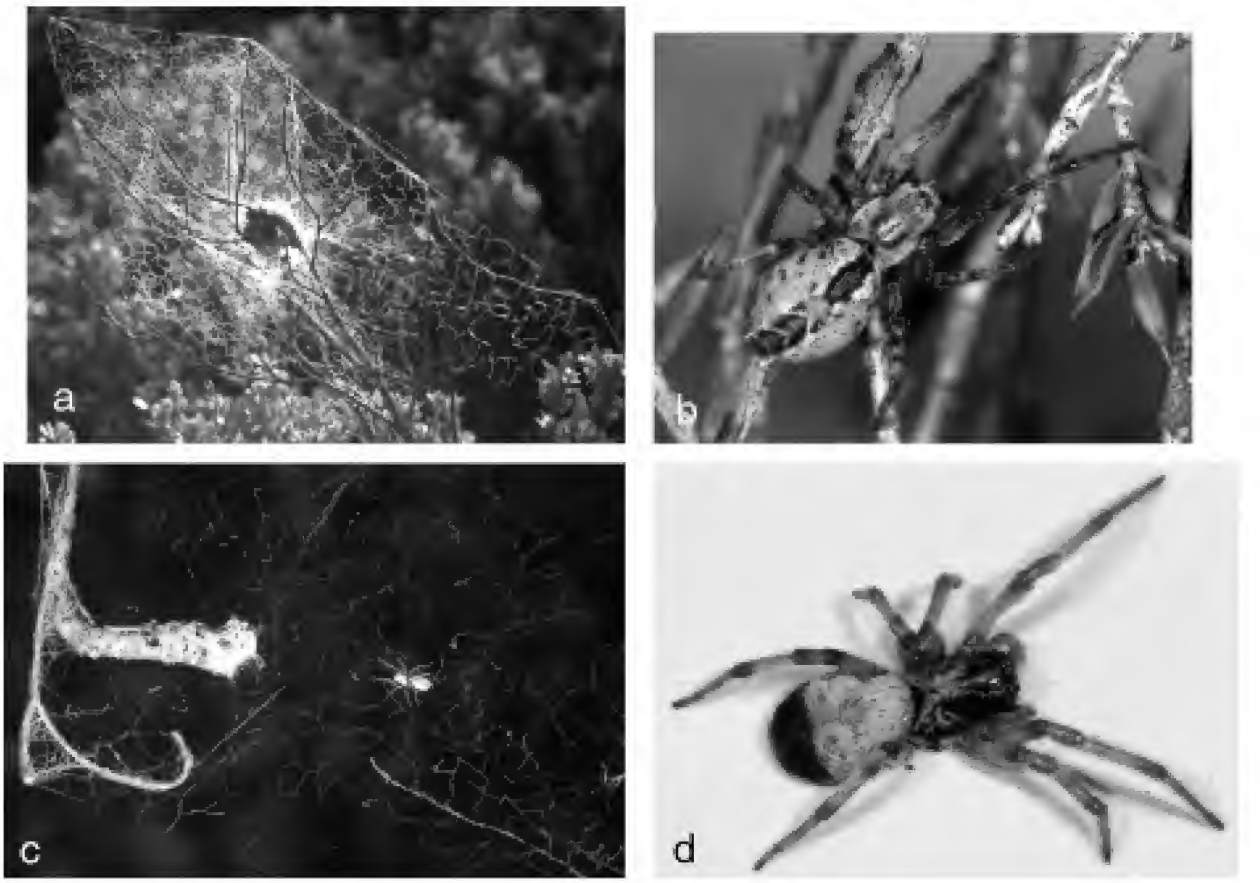

Figure 3. a–d, spiders and webs. a,b, *Phryganoporus candidus*: a, communal web; b, female. c, *Phryganoporus nigrinus*: female on solitary web with horn-shaped retreat. d, *Phryganoporus melanopygus*: female (note partial loss of white setae on carapace).

Description

Male (KS6937). BL 6.25, CL 2.88, CW 2.10, LL 0.46, LW 0.64, SL 1.49, SW 1.32. Shape and colouration similar to female. Spination: leg I, femur d112 0011, tibia v022 p101 r101, metatarsus d002 v221 p011 r0101; leg II, femur d112 p011, tibia v012 p011 r0101, metatarsus d012 v121 p011 r0101; leg III, femur d113, tibia v002 p11 r11, metatarsus d12 v121 p11 r11; leg IV, d112, tibia v012 p101 r101, metatarsus d002 v121 p011 r001. Male palp with central limb of "S" shaped embolus/conductor slanting diagonally across bulb; apical section of "S" narrow, about half as wide as basal section. Palpal patella usually without an apophysis, but a small conical to digitiform apophysis may be present; white, spatulate hairs present or absent.

Female (KS6936). BL 7.80, CL 3.68, CW 2.54, LL 0.37, LW 0.46, SL 1.81, SW 1.46. Carapace colour silvery grey to greyish-brown. Abdomen light grey-brown with brown patterning. Anterior mid-dorsal stripe dark grey-brown, lightened by white hairs centrally, and bordered by white hair patches. Behind the stripe is a row of 4–5 chevrons, as wide or wider than the stripe, each coalescing centrally, the first chevron poorly defined, usually much lighter brown than the rest. Remaining chevrons are brown centrally and variably bordered with darker grey-brown pigment, each limited anteriorly by a line of white hairs that terminate laterally as white tufts. Spination: leg I, femur d1212 p111, tibia v222 p101 r0101, metatarsus d0102 v221 p011 r101; leg II, femur d1202 p111, tibia v122 p101 r101, metatarsus d102 v221 p0101 r101; leg III, femur d133, tibia v122 p11 r11, metatarsus d112 v221 p101 r101; leg IV, femur d113, tibia v112 p11 r11, metatarsus d122 v221 p011 r001. Transverse epigynal ridge broad, often indented anteriorly, sometimes posteriorly also, longitudinal width one-third to one-fifth as wide as epigynal fossa. Fossa as long as wide or anteriorly wider than long. Lateral teeth usually broadly pointed. Female genitalia with short, interlobar ducts curving laterally between the central and distal spermathecal lobes. Distal lobe usually rounded to transversely ovoid; longitudinally ovoid in some populations (Fig. 5f,i).

Distribution. Mainland Australia (Fig. 4a) and Norfolk Island in open forest to shrubland habitats. A single collection from Hobart, Tasmania (Hickman Collection, AMS) may be anthropogenic.

Variation. Genitalic and palpal variation is particularly evident in southern mainland populations, potentially making difficult the assignment of individuals between the very similar species, *P. candidus* and *P. vandiemeni*. Variation is notable in the orientation of the distal spermathecal lobes (Fig. 5f,i) and in the development of a male palpal patellar apophysis—vestigial to absent or present (Fig. 5e,g). The two character states, "longitudinal" distal spermathecal lobes and well-developed patellar apophyses, are typically associated, as in the Wee Jasper and Black Mountain populations of southeastern Australia. These spiders are found in both small communal and solitary web retreats and were regarded as representatives of *P. gausapatus* by Gray (1983). However, genetically they are identified with *P. candidus* and form a group within the "*B. candida* clade" of Colgan & Gray (1992).

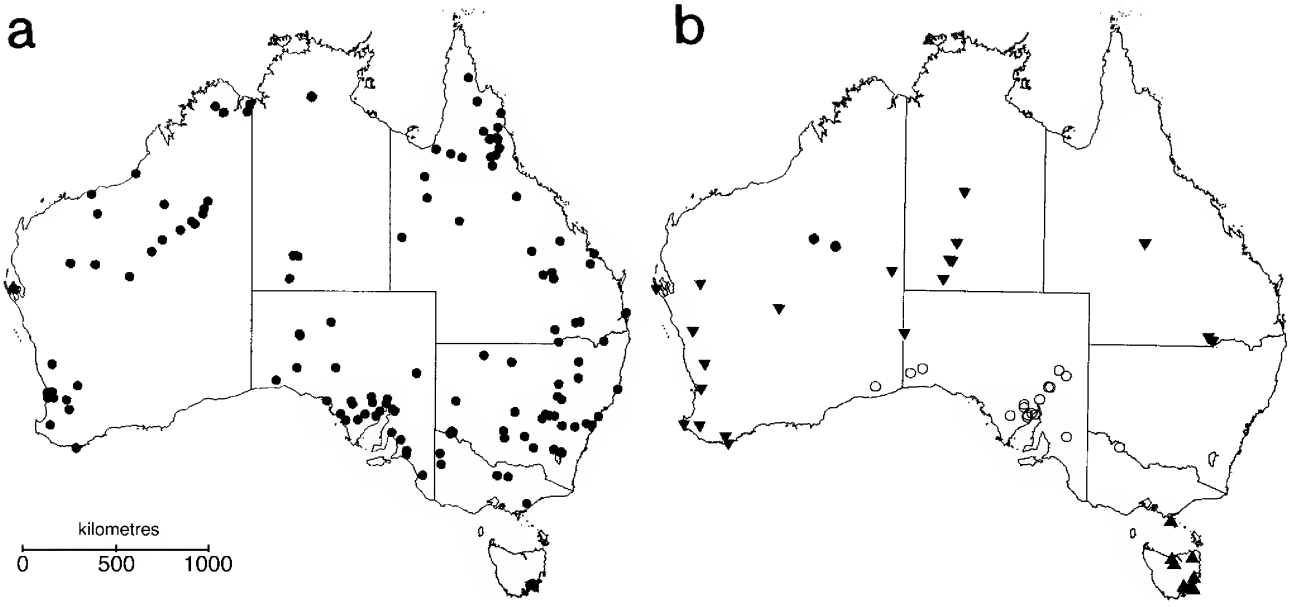

Figure 4. a,b, species distributions based on material examined: a, ● *Phryganoporus candidus*; b, ▼ *P. nigrinus*, ○ *P. davidleei*, ● *P. melanopygus*, ▲ *P. vandiemeni*.

Some males from populations in the St George and Drummond Range areas of S.E. Queensland are unusual in lacking most or all abdominal chevron patterning (which is largely retained in females), and in possessing slightly narrowed palpal cymbia. Examination of more material is needed to confirm whether they represent a new *candidus* group species.

Biology. A detailed study of the biology and behaviour of *P. candidus* is given by Downes (1993, 1994a,b) (see introductory notes). Communal nests observed by the present author varied from a few centimetres to about 30 cm across (Fig. 3a). Most were built on sclerophyllous, often spiky, shrubs and small trees such as mallee eucalypts. The largest *P. candidus* communal nest observed contained 558*j*, subadults and adults—40♂ and 23♀ (KS17177). Small, solitary sheet webs are also common, the retreat consisting of a thick-walled silk tube (Gray, 1983, fig. 36), usually twisted around the plant stem with the mouth opening downward or to the side. The small, lenticular egg sacs contain from 13–39 eggs.

Phryganoporus vandiemeni (Gray) n.comb.

Figs. 4b, 5j–l

Badumna vandiemeni Gray, 1983. Holotype male, Eaglehawk Neck, Tasmania, 43°01'S 147°55'E, 3 Jul 1980, MRG (KS6976, AMS—examined).

Ixeuticus candidus Hickman, 1967: 33, figs. 50, 51.

Badumna vandiemeni Gray, 1983: 257, figs. 29–34; Colgan & Gray, 1992: 86; Platnick, 1989: 408.

Material examined. TASMANIA: female paratypes: KS6977, data as for holotype; KS6978, data as for holotype, 6 Mar 1960, VVH; J763 (TM), Lauderdale, 42°54'S 147°30'E, April 1971. 1♀, KS6042, 8 Mar 1960, other data as paratype KS6978. 8*j*, KS6034, February 1948, in webs on shrubs, other data as above. 1♂, 1*j*, KS19144, Eaglehawk Neck, Taranna area, Tas., 43°02'S 147°53'E, 27 Mar 1988, MRG; in solitary nests on *Acacia uricifolia*. 1♀, KS19146, West of Copping, Tas., 42°49'S 147°45'E, 27 Mar 1988, MRG; on gorse bushes. 1♀, 4*j*, KS23452, outside "Liberty Castle", 18 km S of Devonport, Tas., 41°17'S 146°30'E, 4 Nov 1990, JT; in remnant vegetation (solitary nest on *Acacia* sp). 1♂, 3♀, KS29076, Lenah Valley, Tas., 42°52'S 147°17'E, 22 May 1923, VVH; in webs on shrub. 4♂, 1*j*, KS29094, Cascades, Tas., 41°10'S 147°49'E, 6 Apr 1953, VVH. 1♀, 1*j*, KS31606, 14 km N of Triabunna, Tas., 42°21'S 147°56'E, October 1990, MRG; on *Acacia* (prickly moses), solitary web. 1♀, KS34455, Bruny Island, Alonnah area, Tas., 43°16'S 147°19'E, 28 Oct 1990, MRG, CH & JT; in web on prickly pea. 1♀, 2*j*, KS34470, Bruny Island 4 km S of Alonnah, Tas., 43°16'S 147°19'E, 30 Oct 1990, MRG; in solitary nests. 3♀, KS45065, Electrona, Tas., 43°02'S 147°16'E, October 1990, MRG, CH, JT. VICTORIA. 1♂, 4♀, KS31663, Wilson's Promontory, 39°05'S 146°25'E, April 1990, MRG.

Diagnosis. CL female 2.9–4.0, male 4.0–4.4. In solitary webs. Cribellum divided. Distinguished from *P. candidus* females by the distally recurved interlobar spermathecal ducts; and by the combined presence of longitudinally ovoid distal spermathecal lobes, a male palpal patellar apophysis and solitary webs. Found in Tasmania and far southeast mainland Australia.

Redescription

Male (KS6976, holotype). BL 8.55, CL 4.06, CW 2.80, LL 0.27, LW 0.34, SL 0.96, SW 0.78. Similar to female. Male palpal bulb and tibia like *P. candidus*. Palpal patella with a conical, retrodorsal apophysis, adorned with several white, spatulate hairs (Fig. 5 l).

Female (KS6977, paratype). BL 8.60, CL 3.69, CW 2.48, LL 0.54, LW 0.60, SL 0.88, SW 0.75. Similar to *P. candidus*. Posterodorsal abdominal patterning sometimes lighter, chevrons comprising light brown patches with limited dark brown edging. Lateral tufts of white hairs on chevrons well developed. Epigynal structure as for *P. candidus*. Internal genitalia with longitudinally ovoid distal spermathecal lobes and distally recurved interlobar ducts (Fig. 5k).

Distribution. Tasmania and far southern Victoria in open forest and heathland (Fig. 4b).

Biology. These spiders are known only from solitary webs These webs are commonly associated with sclerophyllous,

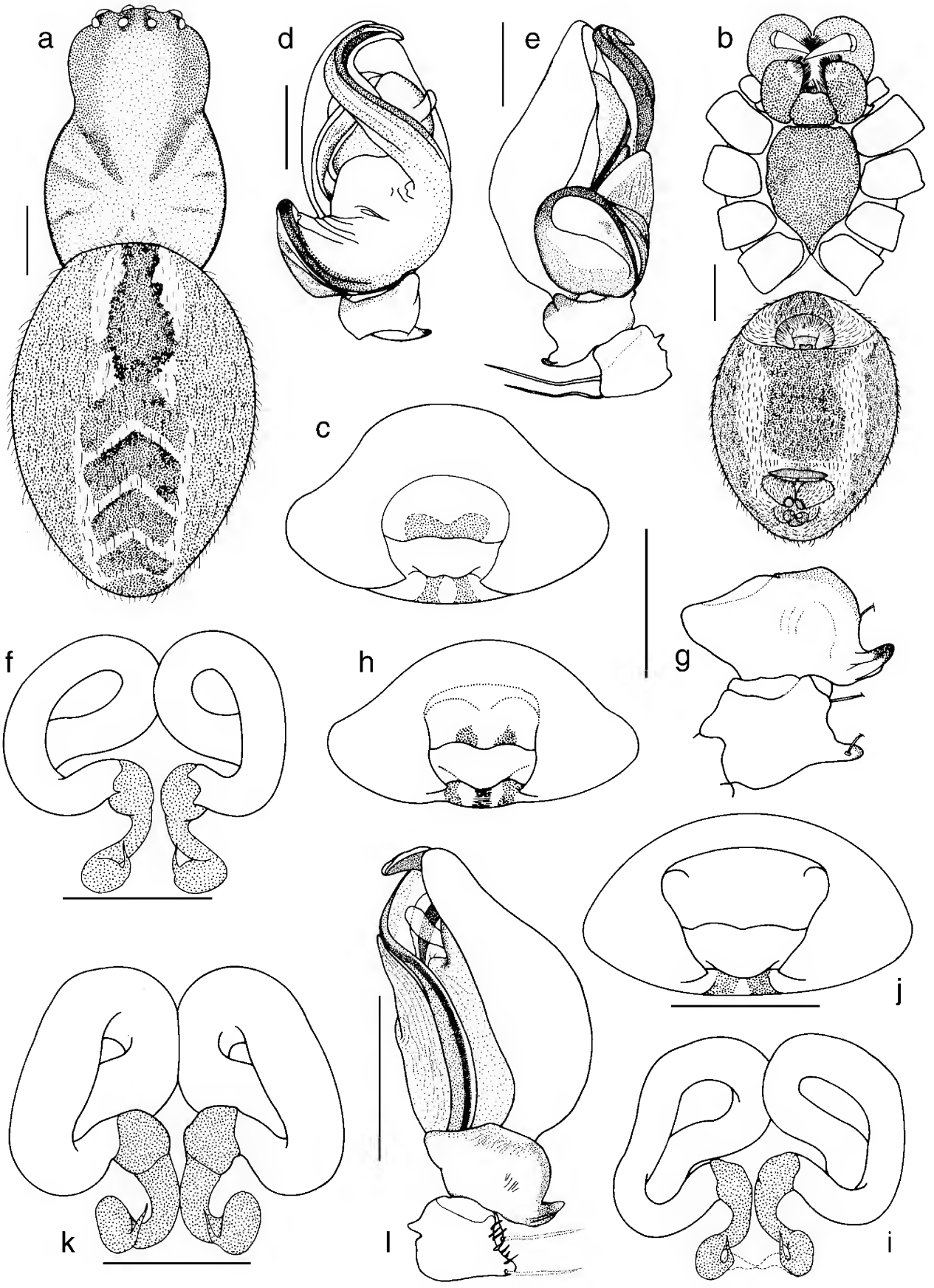

Figure 5. a–i, *Phryganoporus candidus*. a–c, Townsville, Qld, female: a, body, dorsal; b, body, ventral; c, epigynum. d,e, Grenfell, NSW, male palp: d, ventral; e, prolateral. f, Mellin Jerrie Well, WA, female: internal genitalia. g–i, Black Mountain, ACT: g, male palp, retrolateral tibia & patella; h,i, female: h, epigynum; i, internal genitalia. j–l, *Phryganoporus vandiemeni*, Wilson's Promontory, Vic.: j,k, female: j, epigynum; k, internal genitalia. l, male palp, retrolateral. Scale lines: a, b: 1 mm; others 0.5 mm.

often spiky, shrubs, including *Acacia* spp. The web typically consists of a small, irregular cribellate sheet radiating from a central retreat, consisting of a "cowl" of silk forming a roof over a wide entrance funnel opening to the side or down, and leading back into a thick-walled silk retreat tube twisted around a stem. The specimens examined suggest that male spiders are as large or larger than females, in contrast to other species.

Remarks. Electrophoretic studies show that *P. vandiemeni* has fixed differences at three loci and is highly differentiated at a fourth locus (Colgan & Gray, 1992). These studies have also confirmed its presence on the mainland at Wilson's Promontory, Victoria, a southern coastal area formerly connected via a land bridge to Tasmania. The southern mainland distribution of this species may prove to be more extensive, but determination of this will probably require further molecular studies.

Phryganoporus davidleei n.sp.

Figs. 4b, 6a–h

Type material. HOLOTYPE male, N1991365 (SAM), Pinkawillinie Conservation Park, Eyre Peninsula, South Australia, 33°07'S 136°00'E, 19–20 May 1990, D. Hirst. PARATYPES South Australia: 2♂, 1♀, N1991361–3 (SAM), data as for holotype, 21 May 1990. 1♂, KS45778, data as for holotype, 8–19 May 1990. 1♀, N1991378 (SAM), Bunyeroo Gorge, Heysen Range, 31°25'S 138°32'E, 16 May 1990, DH & J.A. Forrest. 1♂, 1♀, KS45799, North Middleback Ranges, 33°04'S 137°08'E, June 1984, BG; on *Daviesia* in mallee woodland. Western Australia: 1♀, KS17138, Nullarbor Plain, Roaches Rest 6N58, 31°32'S 127°18'E, 19 Apr 1987, MRG; solitary retreat with egg sac on doline shrub.

Other material examined. SOUTH AUSTRALIA: 2♂, N1991370–1 (SAM), Lake Dam near Lake Frome, 30°44'S 139°34'E, 10 May 1989, DCL. 1♀, N1992143 (SAM), S of Middleback Station, 32°57'S 137°23'E, June 1984, BG. 1♀, 1*j*, N1991360 (SAM), 20 km N of Cook, 30°27'S 130°19'E, 18 Aug 1980, G.J. Baker. 1♀, *j*, N1991366 (SAM), Lake Gilles Conservation Park, 33°05'S 136°38'E, 24–25 Sep 1988, DH; nest & spiderlings. 1♀, 1*j*, N1991367 (SAM), locality as above, 2 Apr 1987, DCL, DH; in solitary silk nests on dead shrubs. 1♀, N1991368 (SAM), Whyalla Sewerage pond, 33°04'S 137°33'E, 27 Jul 1975, P Hudson. 1♀, N1991369 (SAM), 40 km N of Port Augusta, 32°08'S 137°52'E, 27 May 1986, H. Mincham. 2♂, 3♀, N1991372–6 (SAM), Gammon Ranges towards Elephant Hill from Arcoona Ck, 30°25'S 139°05'E, 5 May 1989, DH. 1♀, N1991377 (SAM), Bunyeroo Ck, ABC Range, 31°25'S 138°34'E, 14–15 May 1990, DH. 1♂, 1♀, N1992137–8 (SAM), S of Middleback Station, 32°57'S 137°23'E, June 1984, BG; in web case on *Muelenbechia cunninghamii*. 1♂, 3♀, N1992139–42 (SAM); from solitary nests. 1♀, N1992144 (SAM), data as for N1992137/8. 1♀, N1992145 (SAM), South Middleback Ranges, 33°11'S 137°06'E, 4 Jun 1984, BG. 1♀, 1*j*, N1992148–50 (SAM), Hughes, 30°43'S 129°31'E, Sep 1984, BG; with spiderlings, web on *Atriplex*. 1♀, N1992156 (SAM), Roonka, 34°18'S 139°38'E, 12–14 Oct 1991, Strathalbyn Field Naturalists. VICTORIA: 2♂, 2♀, N1992178–81 (SAM), south of Red Cliffs, 34°20'S 142°14'E, May 1979, DH.

Diagnosis. Cribellum entire. CL female 1.9–3.5, male 1.8–3.1. Separated from *P. nigrinus* and *melanopygus* by the presence of free abdominal chevrons (pigmentation variable, moderate to weak).

Description

Male holotype. BL 4.28, CL 2.01, CW 1.38, LL 0.26, LW 0.37, SL 1.04, SW 0.83. Similar to female. Spination: leg I, femur d111, p01, tibia v012 p011, metatarsus v221 p11 r11; leg II, femur d111 p01, tibia v12 p11, metatarsus v221 p11 r11; leg III, femur d10 p01, tibia v02 p01 r01, metatarsus d02 v111 p11 r11; leg IV, femur d10, tibia v02 r01, metatarsus d02 v01 p111 r01. Central limb of "S" shaped embolus/conductor passing horizontally across palpal bulb; apical section of "S" relatively broad, more than three-quarters width of basal section. Prolateral tegular bulge height often more than half cymbium length.

Female paratype (KS17138). BL 7.11, CL 3.19, CW 2.13, LL 0.49, LW 0.60, SL 1.54, SW 1.21. Carapace with numerous white hairs, overall colour varying from silvery grey to light brown. Abdomen light grey to brown with dense, recumbent white hair cover, dark brown erect hairs mostly confined to brown pigment flecks. Dorsal abdomen with a dark brown anterior stripe but posterior chevrons mostly lighter brown, occasionally poorly defined. Chevrons not fused. Legs light brown with dark brown pigment rings. Spination: leg I, femur d0110 p0011, tibia v010, metatarsus v222 p010 r0101; leg II, femur d0110 p0001 r0001, tibia v010 p0010, metatarsus v111 p011 r0101; leg III, femur d100 r001, tibia v001 r01, metatarsus v021 p012 r012; leg IV, femur d100, tibia v011 r01, metatarsus v102 p001 r002. Transverse epigynal ridge moderately procurved and narrow, longitudinal width less than one-fifth as wide as epigynal fossa. Fossa wider than long. Lateral teeth narrowly pointed. Internal genitalia Fig. 6g.

Distribution. Central southern Australia in open forest to shrubland (Fig. 4b).

Biology. Documented webs are solitary, consisting of small sheet webs built on shrubs, retreat structure poorly documented, but probably similar to *P. candidus* solitary webs.

Etymology. The specific epithet honours David Lee, former research acarologist and Curator of Arachnology & Helminths at the South Australian Museum.

Phryganoporus nigrinus Simon

Figs. 1b–f,h–j, 2g–j, 3c, 4b, 7a–h, 8a–i

Phryganoporus nigrinus Simon, 1908: 368. Holotype female (MNHN) from Boyanup, Western Australia, 1905 (Stat. 146, Michaelsen and Hartmeyer Expedition to Southwest Australia).
Ixeuticus candidus.–Main, 1971: 119.
Badumna candida.–Gray, 1983: 250, figs. 9, 37.

Material examined. NORTHERN TERRITORY: 1♂, KS55813, Watarrka National Park, King's Canyon, 24°15'S 131°31'E, 16 May 1999, MRG, GAM & HMS; solitary web with horn-shaped retreat on dead shrub. 1♀, KS55814, 1♂, KS55833, data as KS55813. 1♀, KS55818, Watarrka National Park, Kathleen Springs, 24°20'38"S 131°40'54"E, 15 May 1999, MRG, GAM & HMS; in horn-shaped retreat on dead shrub. 1♀, KS55819, 1♀, KS55820, data as KS55818. 1♂, KS55812, data as KS55818 except 16 May 1999. 1♀, KS55821, 1♀, KS55822, 1♀, KS55823, 1♂, 1♀,

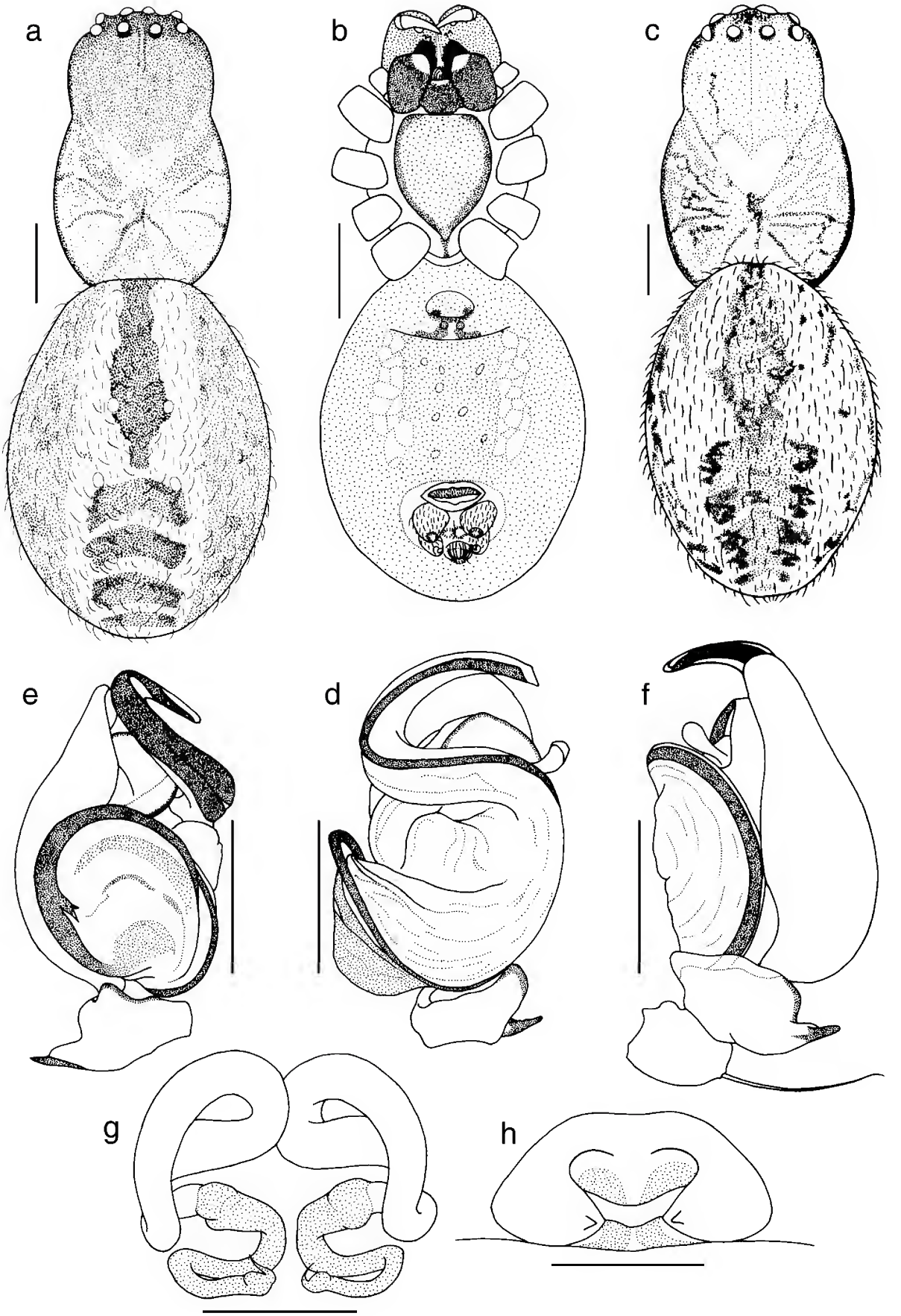

Figure 6. a–h, *Phryganoporus davidleei* n.sp. a,b,g,h, females. a,g, Roaches Rest, WA: a, body, dorsal, g, internal genitalia. b,h, Bunyeroo Gorge, SA: b, body, ventral; h, epigynum. c–f, Pinkawillinie, SA, male: c, body, dorsal; d–f, palp, d, ventral, e, prolateral, f, retrolateral. Scale lines: a–c: 1 mm; others 0.5 mm.

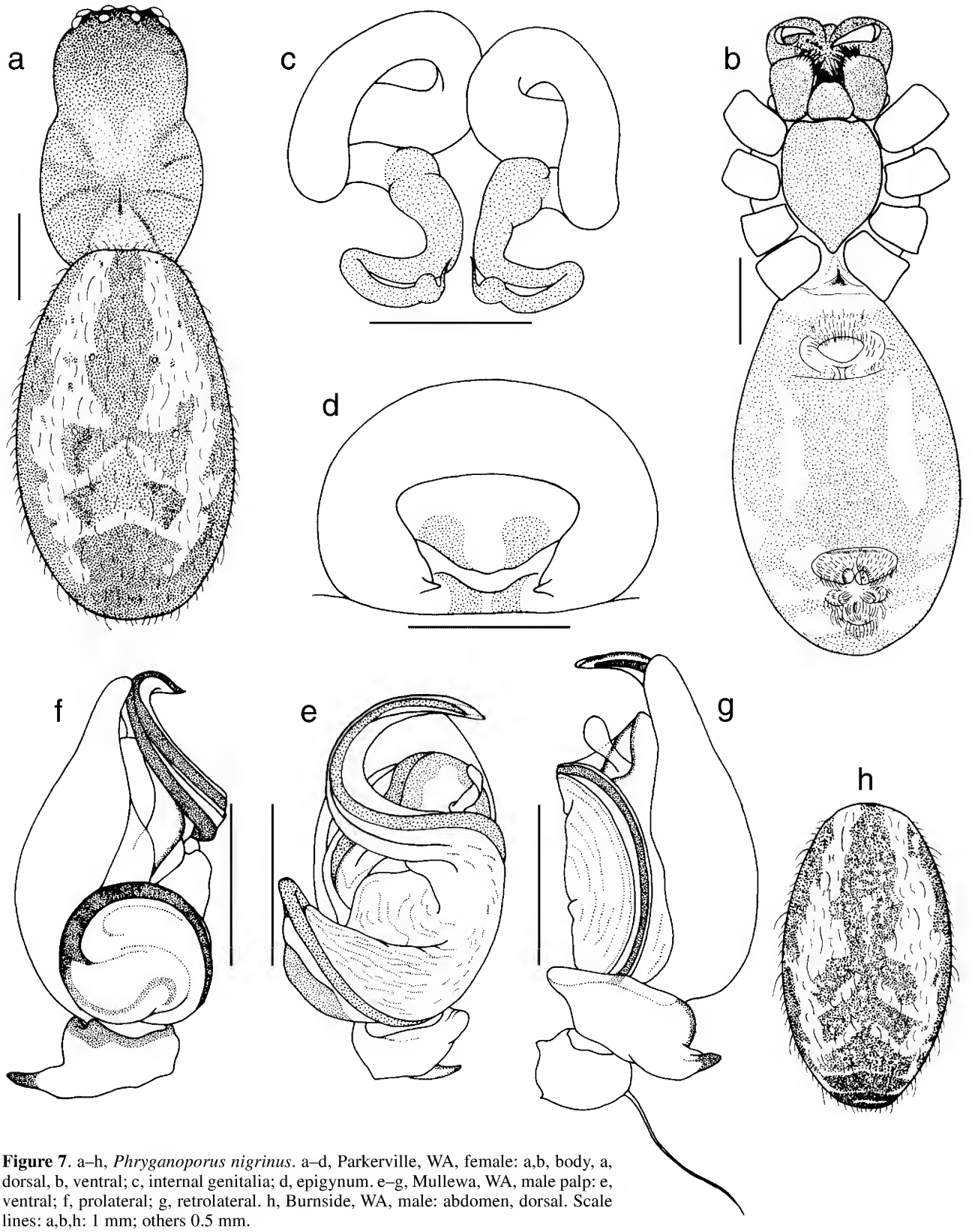

Figure 7. a–h, *Phryganoporus nigrinus*. a–d, Parkerville, WA, female: a,b, body, a, dorsal, b, ventral; c, internal genitalia; d, epigynum. e–g, Mullewa, WA, male palp: e, ventral; f, prolateral; g, retrolateral. h, Burnside, WA, male: abdomen, dorsal. Scale lines: a,b,h: 1 mm; others 0.5 mm.

KS55824, data as KS55812. 1♀, KS55815, 1 km E of Glen Helen, Namatjira Drive, West MacDonnell Ranges National Park, 23°40'57"S 132°40'50"E, 17 May 1999, MRG, GAM & HMS; horn-shaped retreat. 1♀, KS55816, Uluru National Park, 6 km SSW of Ranger Station, 25°24'03"S 130°59'18"E, 13 May 1999, MRG, GAM & HMS; on dead mallee. 1♂, 1♀, KS55826, Uluru National Park, Ranger accommodation area, 25°21'16"S 131°04'11"E, 14 May 1999, MRG, GAM & HMS; on prickly acacia. 1♂, KS55834, S of Barrow Ck near communications

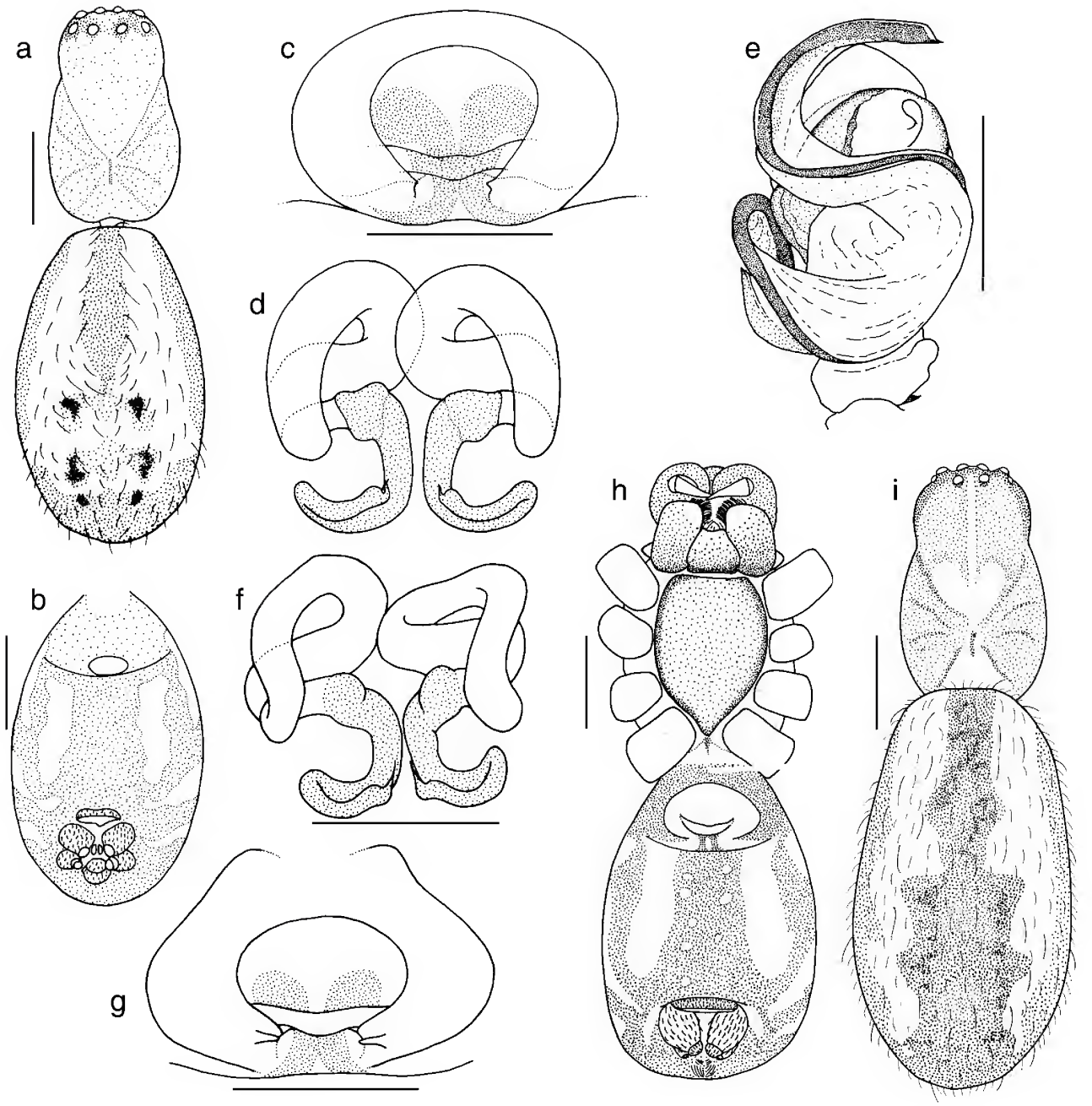

Figure 8. a–i, *Phryganoporus nigrinus*. a–d, Mungindi, Qld, female: a, body, dorsal; b, abdomen, ventral; c, epigynum; d, internal genitalia. e, Kathleen Springs, N.T.: male palp, ventral. f–i, Great Victoria Desert, SA, female: f, internal genitalia; g, epigynum; h, body, ventral; i, body, dorsal. Scale lines: a,b,h,i: 1 mm; others 0.5 mm.

tower beside Stuart Highway, 21°37'43"S 133°45'13"E, 18 May 1999, MRG, GAM & HMS; in short, horn shaped retreat on dead shrub. WESTERN AUSTRALIA: 1♂, KS6941, Burnside, 2.3 km N of Witchcliffe Rd turn off on Caves Rd, Margaret R. region, 33°56'S 115°01'E, 26 Jan 1979, MRG; retreat a horn-shaped tube ("dark colour variant of *B. candida*" in Gray, 1983). 1♂, KS6984, Wooderarrung Ck, 3 km N of Mullewa, 28°32'S 115°30'E, 22 Feb 1979, MRG; on *Acacia brachystachya*. 1♀, 91/1691 (WAM), Parkerville, 31°53'S 116°08'E, October 1976, R. Browne; horn shaped retreat. 1♂, 2♀, 2*j*, N1992175–7 (SAM), Albany, 35°00'S 117°52'E, 27–30 Oct 1981, DH (in separate webs). 1♀, BY19 (AMS), Albany Highway on Capella Rd, 28 Jul 1984, BYM. 1♀, 91/1638 (WAM), Steep Pt Rd, 1 km S of Clough Bar, 26°08'S 113°10'E, 2 May 1990, A.F. Longbottom. 1♀, 91/1656 (WAM), 14 km SW of Bridgetown on Mockerdillup Rd, 34°01'S 116°00'E, 27 Aug 1987, J.M. Waldock. 1♀, 32*j*, 91/1657–90 (WAM), Mt Barker, S of Lookout, 34°38'S 117°40'E, 18 Nov 1990, A.F. Longbottom. 1♀, 91/1695 (WAM), Wal-Arrie Pool, 25°47'S 115°58'E, 7 May 1989, D. Knowles. 1♀, 91/1610 (WAM), Barwidgee Station, 2 km E of Little Well, 27°08'S 121°00'E, 16 May 1990, S. Gilligan. 2♀, 2*j*, 91/1650–3 (WAM), Glen Cummings Gorge, 25°02'S 128°18'E, 13–14 Jan 1990, M.S. Harvey & T.F. Houston; in solitary webs. SOUTH AUSTRALIA: 1♀, N1991356 (SAM), Great Victoria Desert, August 1980. 1♀, *j*, N1991357 (SAM), Great Victoria Desert, 175 km W of Vokes Hill Corner, 28°30'S 129°01'E, 25 Aug 1980, G.J. Baker. 1♀, N1991358–9 (SAM), data as for N1991357; conical, webbed nest on *Acacia colletoides*. QUEENSLAND: 1♀, KS42616, 12 km N of Mungindi beside Carnarvon Highway, 28°53'S 148°57'E, 25 Apr 1994, M. Moulds & JT; eucalypt woodland. 2♀, KS45062 & KS45119, roadside rest area 1 km E of Barcaldine, 23°33'S 145°18'E, 9 Jul 1995, JT, M. Tio, S. Cowan; solitary webs, on dead spiky bush (KS45062) and bottlebrush (KS45119). 5♀, KS44167, roadside rest area 1 km E of Barcaldine, 23°33'S 145°18'E, 1 Aug 1995, JT; solitary webs on dead bushes. 1♀, KS44158, 30 km S of St George, 28°12'S 148°44'E, 2 Aug 1995, JT.

Diagnosis. CL female 2.2–3.1, male 1.8–2.5. Cribellum entire. Separated from *P. davidleei* by the dark brown posterodorsal abdominal patch and from *P. melanopygus* by the rather cylindrical body shape and the horizontal central limb of the S-shaped embolus/conductor. In solitary webs with tapering, horn-shaped retreats (Fig. 3c).

Description

Male (KS6941). BL 5.55, CL 2.44, CW 1.65, LL 0.37, LW 0.42, SL 1.22, SW 0.98. Similar to female. Spination: leg I, femur d112 p0011, tibia v122 p11 r11, metatarsus d002 v221 p011 r011; leg II, femur d112 p001, tibia v112 p11 r01, metatarsus d002 v221 p11 r11; leg III, femur d122 p001, tibia v12 p10 r11, metatarsus v221 p01 r11; leg IV, femur d002 v121 r01, tibia d012 r01, metatarsus d002 v221 p011 r001. Palp with central limb of "S" shaped embolus/conductor passing horizontally across bulb; apical section of "S" relatively broad, about two-thirds width of basal section. Prolateral tegular bulge height less than half cymbium length.

Female (WAM 91/1691). BL 7.23, CL 3.05, CW 1.84, LL 0.46, LW 0.49, SL 1.49, SW 1.14. Body shape more cylindrical than other species. Carapace colour varies from silvery grey to brown, depending on the density of white hairs present. Abdomen silvery grey-brown laterally with both numerous recumbent white hairs and scattered dark brown flecks, the latter increasing in density ventrolaterally. Anterior mid-dorsal stripe broad, dark brown and coalescent behind with the first chevron marking. The remaining four to five chevrons are dark brown, free anteriorly but partially or fully fused posteriorly, forming a dark patch on the posterodorsal abdomen. Legs with wide, brown-black pigment rings. Spination: leg I, femur d111 p001, tibia v012 p01010, metatarsus v221 p0101 r0101; leg II, femur d110 p001, tibia v011 p01010, metatarsus d002 v221 p0101 r0101; leg III, femur d101, tibia v001 r0010, metatarsus d002 v221 p0101 r0101; leg IV, femur d100, tibia v011 r0010, metatarsus d001 v111 r001. Transverse epigynal ridge procurved and narrow, longitudinal width less than one-eighth as wide as epigynal fossa. Fossa wider than long. Lateral teeth narrowly pointed. Internal genitalia Figs. 7c, 8d,f.

Distribution. Western Australia, central Australia, western Queensland (Fig. 4b). In open forest, woodland and shrubland.

Variation. Female specimens from the Great Victoria Desert (SAM 1991356–9) were a distinctive light, rusty reddish colour (in alcohol) with all chevrons fused (Fig. 8h). Specimens from Queensland have weakly pigmented abdominal patterning (Fig. 8a) compared with central & western Australian representatives.

Biology. *P. nigrinus* occupy solitary sheet webs. The simple, asymmetrical, sheet rarely spans more than 25 cm and is often found on the dead branches of spindly shrubs. The retreats are of unique shape throughout the large range of this species—elongate, horn-like silk tubes attached along a branch, with the wider entrance usually opening downward, sometimes to the side (Fig. 3c, from the Kimberley region of northwestern Australia; Gray, 1983, fig. 37, from south western Australia [attributed to *B. candida*]; and Main, 1976, fig. 40a [attributed to *Dictyna* sp.]).

Phryganoporus melanopygus n.sp.

Figs. 3d, 4b, 9a–h

Type material. HOLOTYPE ♂, KS45120 (AMS), track to Windy Corner, Western Australia, 23°30'S 124°35'E, 16 Aug 1990, A.E. de Jong. PARATYPES: 2♀ (with 5*j*), KS23446 (AMS); 1♂, KS45121 (AMS); all data as for holotype. 1♀, 91/1619 (WAM), Canning Stock Route, Western Australia, 23°05'S 123°12'E, 19 Jul–1 Nov 1987, AEJ; tube nest.

Diagnosis. CL female 2.8–3.5, male 1.9–2.2. Separated from all other species by the strong dark brown pigmentation covering the distal third of the abdomen; and from *P. nigrinus* and *P. davidleei* by the gently distally sloping central limb of the S-shaped embolus/conductor.

Description

Male holotype. BL 3.95, CL 1.93, CW 1.38, LL 0.24, LW 0.37, SL 1.00, SW 0.82. Similar to female but usually with two distinct abdominal chevrons, remainder fused posteriorly. Spination: leg I, femur d112 p01, tibia v012 p01 r11, metatarsus d01 v221 p11 r11; leg II, femur d112 p01, tibia v012 p11 r10, metatarsus d02 v211 p011 r11; leg III, femur d112 p01, tibia v02 p01 r01, metatarsus d02 v111 p011 r011; leg IV, femur d111 p01, tibia v02 r01, metatarsus d02 v111 p011 r01. Central limb of "S" shaped embolus/conductor angled gently upward across the upper palpal bulb. Apical section of "S" relatively broad, about two-thirds the width of basal section. Prolateral tegular bulge height usually less than half cymbium length.

Female paratype (KS23446). BL 7.27, CL 3.29, CW 2.24, LL 0.45, LW 0.65, SL 1.75, SW 1.29. Carapace silvery grey to brown depending on density of white hair cover. Anterior two-thirds of abdomen silvery grey with middorsal stripe present but rendered indistinct in life by dense white hair cover. One or two brown chevrons of variable size present, remainder completely fused so that entire distal third of abdomen is dark brown. Legs brown with dark brown pigment rings. Abdomen may broaden posteriorly. Spination: leg I, femur d111 p001, tibia v122 p1010 r0100, metatarsus d002 v221 p001 r0101; leg II, femur d101 p001, tibia v102 p0010, metatarsus d001 v221 p0101 r0101; leg III, femur d100 p001, tibia 002 r010, metatarsus d001 v2111 p001 r001; leg IV, femur d112, tibia v002 r010, metatarsus d001 v011 p01 r001. Transverse epigynal ridge indented anteriorly, longitudinal width about one-fifth as wide as epigynal fossa. Fossa wider than long. Lateral teeth narrowly pointed. Internal genitalia Fig. 9f.

Distribution. Shrubland habitats of the Great Sandy Desert, Western Australia (Fig. 4b).

Etymology. The specific epithet refers to the darkly pigmented posterior abdomen.

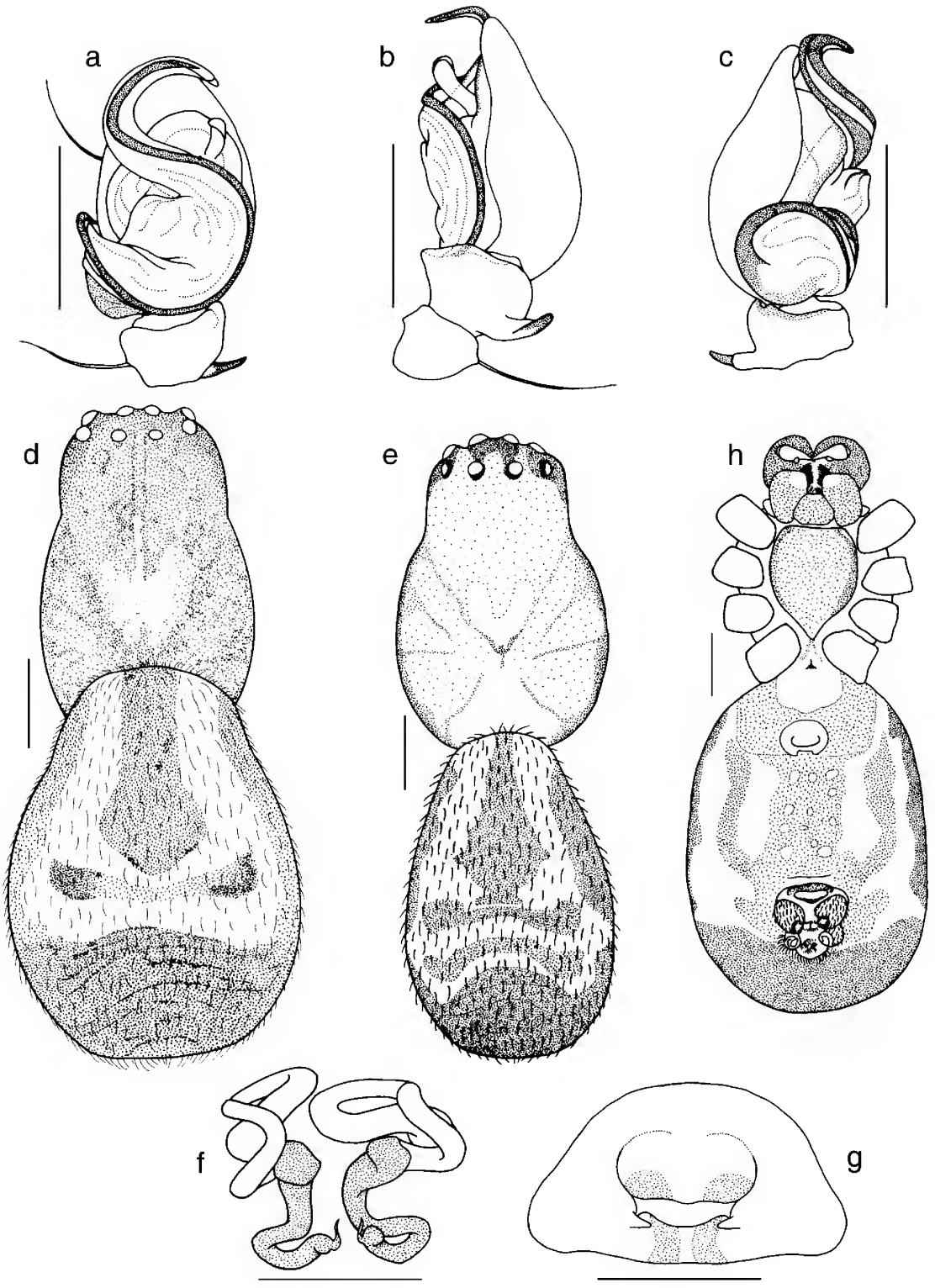

Figure 9. a–h, *Phryganoporus melanopygus* n.sp. a–g, Windy Corner, WA. a–c, male palp: a, ventral; b, retrolateral; c, prolateral. d,e, body, dorsal: d, female; e, male. f,g, female: f, internal genitalia; g, epigynum. h, Canning Stock Route, WA, female: ventral body. Scale lines: d,e,h: 1 mm; others 0.5 mm.

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Therlinya, A New Genus of Spiders from Eastern Australia (Araneae: Amaurobioidea)

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ABSTRACT. *Therlinya*, a new genus of cribellate amaurobioid spiders from eastern Australia, readily distinguished by its arched, unpatterned carapace, is described. It includes eleven new species: *Therlinya kiah, T. foveolata, T. bellinger, T. horsemanae, T. wiangaree, T. ballata, T. vexillum, T. lambkinae, T. angusta, T. monteithi*, and *T. nasuta*. All are forest dwelling species that build small sheet webs in sheltered microhabitats. Distribution maps and comments on relationships and biology are given.

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Therlinya n.gen. is one of many sheet web building amaurobioid spider groups associated with forested coastal and highland regions in eastern Australia. In particular, it is related to several undescribed genera from eastern and southwestern Australia that are characterised by the presence of longitudinal stripes on the carapace (Gray & Smith, in prep.), a feature lacking in *Therlinya*. All are forest dwelling species that build small sheet webs with funnel retreats opening from crevices or shallow burrows on logs, soil banks or under rocks.

Therlinya and its relatives can be characterised as stiphidioid spiders placed in or near the family Stiphidiidae. *Stiphidion*, the type genus of the family has characters that seem to markedly distinguish it from other stiphidioids, notably the recurved PER, the relatively long PLS and the bulbous tegulum with its distal sperm duct loop directed anti-clockwise (clockwise in *Therlinya* and *Baiami*). The Stiphidiidae has been variously constituted within the Amaurobioidea. Lehtinen (1967) limited the Stiphidiinae (placed within his Amaurobiidae) to three Australian taxa: *Stiphidion* Simon (previously placed in the Psechridae and the Dictynidae), *Tjurunga* Lehtinen and *Baiami* Lehtinen. *Tjurunga* is based upon an odd Tasmanian species (*Rubrius paroculus* Simon, known only from the type female) which has the unusual cheliceral tooth pattern of 7+4 and a wide, distinctly cleft colulus. It may be related to another Tasmanian genus (Gray, in prep.) which has a similar colulus but a tooth pattern of 2+3. Forster & Wilton (1973) expanded their Stiphidiidae to include, besides *Stiphidion* and *Baiami*, *Corasoides* Butler, *Cambridgea* L. Koch, *Nanocambridgea* Forster & Wilton, *Procambridgea* Forster & Wilton and *Ischalea* L. Koch. Davies (1988) excluded the latter two genera from the Stiphidiidae in a review of *Stiphidion* and its relationships. *Cambridgea* and *Nanocambridgea* were recently reviewed by Blest & Vink (2000) as stiphidiid spiders but with no comments on relationships.

The presence of a grate-shaped tapetum in the posterior eyes of *Stiphidion* prompted Griswold (1993) to suggest that this genus belonged with the Lycosoidea. However, other characters (notably the presence of fused paracribellar spigots on the PMS) have supported its retention within the Amaurobioidea (Griswold *et al.*, 1999; Davies & Lambkin, 2000), inferring that the grate-shaped tapetum has arisen independently in these two superfamilies. Like *Stiphidion, Therlinya* and its related "striped" group of genera have grate-shaped tapeta. Griswold *et al.* (1999) also noted the

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presence of this character in *Baiami* but the type of tapetum present in most other putative stiphidiids is not known. Nonetheless, this character is a potentially unifying feature for "stiphidioid" spiders.

Stiphidioid spiders such as *Stiphidion, Therlinya* and *Taurongia* Hogg are characterised by the presence of indirect eyes with grate-shaped tapeta (tapetum type unknown in *Taurongia*); large size of AME; chilum median, entire; 2+3 cheliceral teeth; feathery hairs; spiniform embolus; a membraneous T-shaped conductor; two RTAs; MA present or absent; cymbial flange and trichobothria; epigynum typically with paired lateral fossae; no epigynal teeth; cribellum divided, ALS with two MAP; PMS with grouped paracribellar spigots; PLS slender, longest, with 1–3 paracribellar spigots; calamistrum proximal to central; typically run inverted under the sheet web.

Several of these characters are shared with some of Forster & Wilton's Agelenidae, notably the male palpal morphology (cf. *Orepukia, Mahura*) and, in some ecribellate taxa, the cleft colulus (cf. Orepukia). These authors noted that a firm separation between their Stiphidiidae and Agelenidae is difficult (Forster & Wilton, 1973).

The cladogram of Griswold *et al.* (1999), shows a weak stiphidioid clade (*Stiphidion* and *Baiami* with *Neolana* Forster & Wilton) supported by a single, dubious synapomorphy ("web posture erect"). They score the first two genera as "inverted" (correct for *Baiami*) while *Neolana* is scored as "erect". The web of *Neolana* (Forster & Wilton, 1973: 273) shows at least a superficial resemblance to that of *Stiphidion*, including that spider's habit of sitting on the substrate above the web. But how these spiders actually move on the web is not clear. The web position of *Stiphidion* is ambiguous because, except during egg sac construction, it is rarely seen on the web. These spiders sit on rock or wood substrates, sheltered within the short, central columnar attachments of their umbrella shaped webs. They catch most

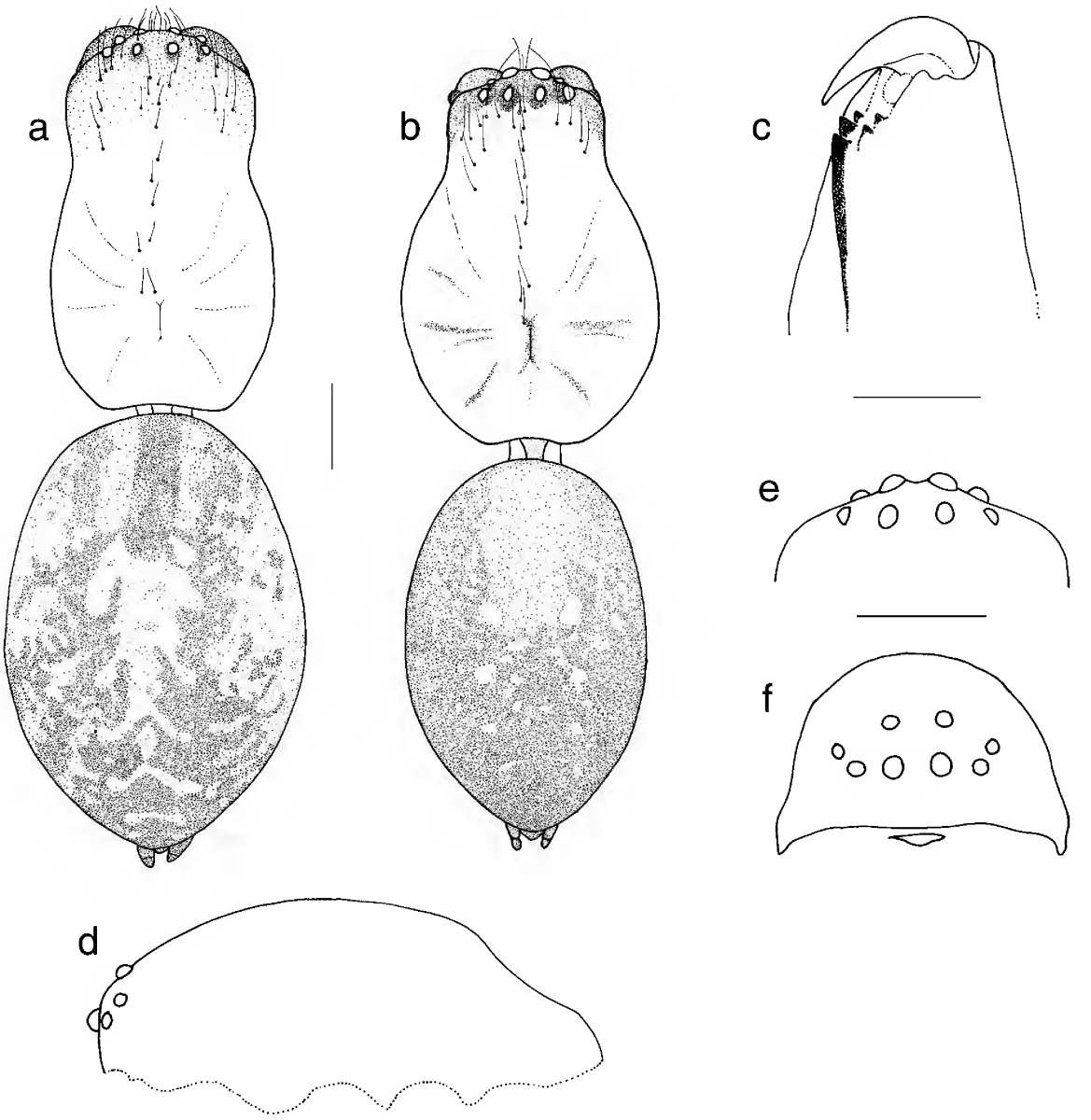

Figure 1. a,b, body, dorsal: a, *Therlinya kiah*, female; b, *T. lambkinae*, male. c–f, *T. kiah*, female: c, cheliceral teeth; d, carapace, lateral; e,f, eyes, e, dorsal; f, frontal (with chilum). Scale lines: a,b and d–f, 1.0 mm; c, 0.5 mm.

of their prey on the substrate under or at the guyed outer edges of the "umbrella". While it is likely that *Stiphidion* and *Neolana* both had simple sheet web building ancestors, we cannot infer their web posture, especially in the absence of a well supported plesiomorphic sister group (cf. *Tartarus* and *Baiami* (Gray, 1992)). Compared with *Stiphidion* and *Therlinya, Neolana* has a very distinctive palpal bulb structure, small AME, spinnerets of equal length, no feathery hairs and no flange or trichobothria on the cymbium. Its relationships remain speculative at present.

The absence of a grate-tapetum in *Corasoides* (M. Humphries, pers. comm.) suggests that this very distinctive genus is not a stiphidioid. As well, *Corasoides* spp run erect on top of the sheet web (contrary to Forster & Wilton, 1973), rather than inverted below it like other putative stiphidioids.

Taurongia Hogg and its undescribed relatives in eastern Australia and Tasmania (Gray, in prep), as well as *Baiami* and *Tartarus* Gray, generally fit within the stiphidioid definition given above. The absence of a divided conductor apex in *Therlinya* and its closest relatives (the "striped carapace" genera) contrasts with its presence in *Stiphidion, Taurongia* and *Baiami*, in all of which the embolus terminates on the outer branch. The appearance of the median apophysis is highly variable. It is absent in *Stiphidion* and *Baiami*, fleshy, sclerotised or reduced in *Therlinya* and its close relatives, a sclerotised spine or absent in the *Taurongia* group.

Baiami (Gray, 1981) seems closest to *Taurongia* but has some distinctive features which may indicate that it occupies a basal position with respect to the other genera. For example, the conductor lacks a tegular window (which is present but very small in *Taurongia* group genera) and forms a wide circular membrane attached basally to the tegulum; the epigynal fossa is not or only weakly divided; and the PMS lack the level of fusion of the paracribellar spigots currently seen in most stiphidioids. Typically, the PMS paracribellar spigots are either all fused, as in *Stiphidion* and *Therlinya* (Fig. 3c), or mostly fused, as in *Taurongia* group genera, where the fused spigots are usually accompanied by one or more single (free) spigots. However, in *Baiami brockmani* the PMS paracribellar spigots are either all free, or fusion is restricted to the odd pair of paracribellar spigots (Fig. 3f).

The conical, apical PLS segment is longest in *Stiphidion* and its spigots are also more elongate than in *Therlinya*. A PLS modified spigot and 3 free associated paracribellar spigots are present in both genera. In *Baiami brockmani* there are also 3 paracribellar spigots, but two have their bases fused together, while the other has its base fused with the modified PLS spigot base. In other putative stiphidiid genera examined, either 2 or 3 free paracribellar spigots were present, except in *Taurongia* where only one could be found.

Material and methods

Specimen examinations, measurements and drawings were made using a Wild M5 microscope with graticule and drawing attachment. Epigynal preparations were cleared in 8% potassium hydroxide before mounting in glycerol for microscopic examination. Specimen preparations for scanning electron microscopy were air dried from 100% acetone.

Abbreviations and definitions. "Tegular window" refers to the gap between the proximal embolus and the lower edge of the conductor stem. BL, body length; CL, carapace length; CW carapace width; CapW, caput width; EGW, eye group width; AME, anterior median eyes; ALE, anterior lateral eyes; PME, posterior median eyes; PLE, posterior lateral eyes; MOQ, median ocular quadrangle; AER, anterior eye row; PER, posterior eye row; LL, labium length; LW, labium width; SL, sternum length; SW, sternum width; RTA, retrolateral tibial apophysis; RVTA, retrolateral ventral tibial apophysis; ALS, anterior lateral spinnerets; PMS, posterior median spinnerets; PLS, posterior lateral spinnerets.

Repository institutions. Specimens listed under accession numbers prefixed KS are deposited in the Australian Museum, Sydney (AMS). All other specimens are lodged in the Queensland Museum (QM).

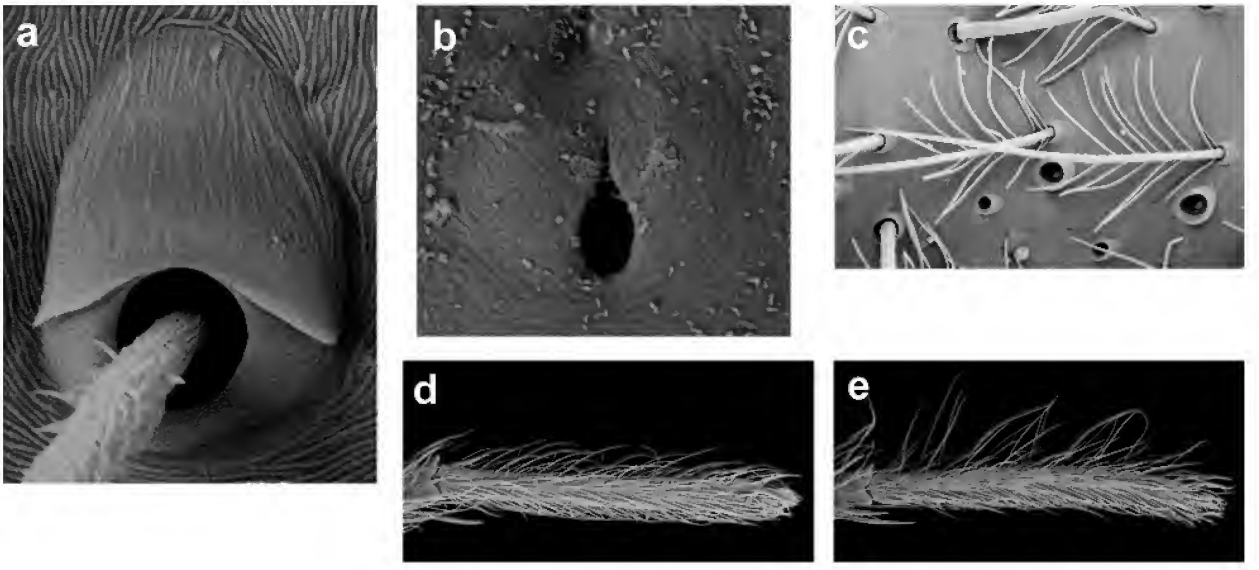

Figure 2. a–e, sensilla, *Therlinya kiah*: a, trichobothrium, female leg I; b, tarsal organ, male leg II; c, feathery hairs on leg; d, e, hairs on tarsus, lateral; d, female, leg I; e, male, leg II.

Therlinya n.gen.

Type species. *Therlinya kiah* n.sp.

Etymology. The generic name is an Aboriginal word meaning "tongue". It refers to the shape of the epigynal scape present in most species. The gender is female.

Diagnosis. *Therlinya* is readily distinguished by its arched, unpatterned carapace. It differs from *Stiphidion* by the PER being procurved to straight; from *Taurongia* and *Baiami* by the possession of a prominent, fleshy median apophysis; from *Tartarus* by its possession of eyes.

Description. Medium-sized cribellate spiders (CL 2.9–4.8) which build suspended, semi-horizontal sheet webs with shallow retreat tunnel; spiders run underneath sheet. Colour (in alcohol). Cephalothorax cuticle amber coloured, deepest on caput, mouthparts and sternum. Colour pattern (Fig. 1a,b): carapace pallid grey-brown, without obvious patterning; dorsal abdomen with anterior grey/brown stripe (may be indistinct) in paler patch, followed by small cream coloured chevrons (or dots in northern species), reducing in size posteriorly; background colour grey/brown, often lightest anterolaterally & darkest on posterior abdomen; underside dark laterally, then two longitudinal pale cream stripes (sometimes rows of spots) enclosing buff-grey area with two additional often indistinct pale stripes nearer midline; leg femora and tibiae with grey pigment bands, sometimes indistinct to absent in north Queensland species. Feathery, semi-recumbent hairs abundant on abdomen, carapace and legs (Fig. 2c), plus long & short plumose hairs. Long, curved plumose hairs common on leg metatarsi I, II, but absent on tarsi except male tarsus II (Fig. 2e). Carapace (Fig. 1a,b,d) with prominent, broad caput, wider in female, strongly arched, highest at mid-caput (Fig. 1d). Fovea a long slit curving almost halfway down rear slope of carapace. Clypeus 3 × width of an AME. Chilum an undivided, median plate (Fig. 1f). Eyes: Fig. 1e,f. Eight small, in two rows, facing forward. EGW less than two-thirds (0.6–0.64×) width of caput. From above AER recurved, PER weakly procurved to straight. AME≥ALE>PME>PLE or AME>PME=ALE>PLE; AME relatively larger in male. MOQ almost square, slightly narrower anteriorly. Posterior eyes with grate-shaped tapetum. Chelicerae vertical and moderately robust, with boss, fangs with serrate retroventral margins; retromargin with one long, modified seta near base of each fang, numerous modified setae along promargin. Cheliceral tooth pattern—retromargin 2; promargin 3, base of last promarginal tooth extended as a strong carina (Fig. 1c). Maxillae longer than wide, lateral margins weakly undulate to straight, strong linear serrula present. Labium longer than wide or subequal, apically truncate, laterobasally excavated. Sternum longer than wide, shortly pointed between coxae IV. Legs typically 1423 or 1243. Trochanters notched. Spines: Palpal tarsus spinose. Representative leg spination (*T. kiah*). Male (KS58184)—I: femur d1112, p0011; tibia d001, v222, p111, r111; metatarsus d2112, v221, p0101, r0101. II: femur d1202, p0111; tibia d001, v222, p111, r11; metatarsus d2102, v221, p0101, r0101. III: femur d1202, p0111; tibia d11, v212 (112), p11, r11; metatarsus d212, v221, p011, r011. IV: femur d1102, p0001; tibia d101, v112, p11, r11; metatarsus d222, v221, p011, r001. Female (KS58186)—I: femur d1202, p0011; tibia d0010, v220 (222), p111, r101; metatarsus d0202, v221, p1101, r101. II: femur d1102, p0011; tibia d0010, v220, p111 (101), r101; metatarsus d112, v221, p100, r101. III: femur d1102, p0011; tibia d01 (11), v111, p101, r01 (11); metatarsus d212, v221, p11, r11. IV: femur d1102, p0 (0001); tibia d11, v112, p11, r01 (11); metatarsus d222, v211, p011, r001. Three tarsal claws: superior 6–12 teeth, inferior 0–2 teeth. Palpal claw with 8–10 teeth. Claw tufts and scopulae absent; male ventral tarsi with numerous short, inclined hairs. Trichobothria increasing in length distally, in single row on tarsi (6–8) and metatarsi (6–7); two rows on tibia; present on palpal tarsus and tibia. Bothria collariform, proximal plate longitudinally ridged (Fig. 2a). Tarsal organ capsulate, finely ridged longitudinally, with ovoid "keyhole" shaped pore (Fig. 2b); placed distal to trichobothria. Male palp: Figs. 4a,b, 11a,b. Trichobothria present on tibia and cymbium. Tibia rather short, with strong prolateral bristles and two retrolateral apophyses: a central-dorsad RTA and a ventrad and apical RVTA, broad-based with a blunt, beak-like apex directed ventrally. Cymbium wide basally with a prominent retrolateral flange and a moderately short, coniform apex. Tegulum with a retrolateral or basal tegular lobe, partially enclosing the S-shaped part of sperm duct; distal loop of sperm duct running anti-clockwise. Embolus origin retrolateral to basal, curving around conductor margin as a long, robust, tapering spine, flattened distally. Conductor large, membraneous, asymmetric T-shape, posterior limb of "T" very short, anterior limb much longer and apically undivided; conductor margin reflected to form a groove for embolus. Tegular window present, placed retrobasally to prolaterally. Median apophysis lobular, a blunt, fleshy process placed centrally above base of conductor. Epigynum typically with a sclerotised, tongue-shaped scape (Figs. 4c–g) enclosing a pair of lateral fossae; sometimes scape reduced (Fig. 16a) or absent (Figs. 5c,d, 7c). Lateral teeth and lobes absent. Internal genitalia (Fig. 4h) simple, with anterolateral copulatory openings leading into broad, proximally flattened copulatory ducts (exceptionally short in *T. bellinger*) curving back to a pair of round-ovoid, glandulate spermathecae (Fig. 13e) placed anterior or lateral to epigynal fossae. Tracheal system simple, with four unbranched tracheal tubes confined to the abdomen. Spiracle just anterior to & half as wide as, cribellum. Calamistrum almost half length of metatarsus, subproximal-central, delimited at each end by a retrodorsal spine; absent in male. Spinning organs: Fig. 3a–e (female). Cribellum bipartite with two ovoid spinning fields, each about three times as wide as long and well separated by one third of a field width; posterior cribellar margin convex and strongly sclerotised; male cribellum almost as wide as in female with small, non-functional fields. Spinnerets relatively short. ALS and PLS 2-segmented, latter slightly longer; PMS 1-segmented, short; ALS broad with very short apical segment with moderately broad margins; PLS slender with moderately long, conical, apical segment. ALS spigots: 2 major ampullate spigots on mesal side, anterior largest; c. 80 piriform spigots. PMS spigots: two grouped paracribellar bases ectally, each with 7–8 spigots; 1 minor ampullate spigot anteriorly (adjacent to anterior paracribellar base); 1 posterior cylindrical spigot (adjacent to posterior paracribellar base); 8–9 aciniform spigots. PLS spigots: 1 apical "modified PLS spigot" flanked by 3 free paracribellar spigots; 2 cylindrical spigots on mesal side; c. 30 aciniform spigots.

Figure 3. a–e, spinnerets, *Therlinya kiah* (KS3659, ♀): a, spinning field; b, ALS; c, PMS; d, PLS; e, detail of PLS apex with modified PLS spigot. f, PMS, *Baiami brockmani* (♀), arrows to a single and a double Pc spigot base. Spigots: MAP, major ampullate; mAP; minor ampullate; Cyl, cylindrical; mPLS, modified posterior lateral spinneret; Pc, paracribellar

Included species. *Therlinya kiah, T. foveolata, T. bellinger, T. horsemanae, T. wiangaree, T. ballata, T. vexillum, T. lambkinae, T. angusta, T. monteithi, T. nasuta*.

Distribution. Eastern Australia.

Biology. These cribellate web builders are associated with open and closed moist forest habitats of the eastern highlands and coast. They run on the underside of semi-horizontal sheet webs up to 30 cm wide, suspended from funnels leading into burrows 4–10 cm deep in soil banks or

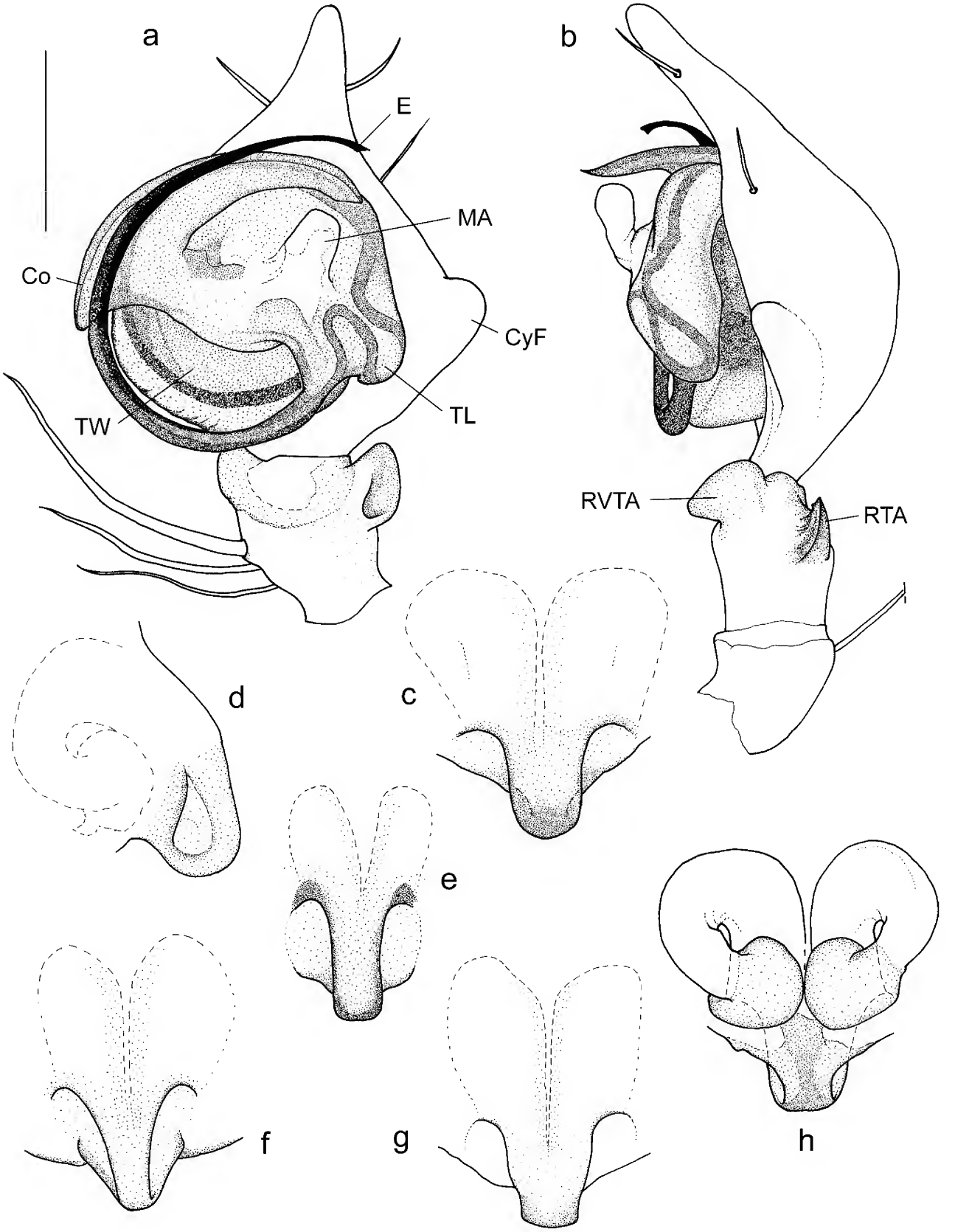

Figure 4. *Therlinya kiah*. a,b, male palp (holotype): a, ventral, b; retrolateral, (embolus free of conductor). c–h, epigynum: c, e–g, ventral; d, lateral; h, dorsal—internal genitalia. Scale line 0.5 mm. (c,d,h, KS58185; e, KS58186; f, KS58194; g KS58202). Co, conductor; CyF, cymbial flange; E, embolus; MA, median apophysis; TL, tegular lobe; TW, tegular window; RTA, retrolateral tibial apophysis; RVTA, retrolateral ventral tibial apophysis.

logs. The egg sacs are rounded, suspended from the basal burrow roof. A captive female *T. kiah* (KS58191), sealed within a silk chamber from approximately 1 April to 10 June 1978, produced an egg sac and 224 spiderlings.

Remarks. *Therlinya wiangaree, T. ballata* and *T. vexillum* from the Border Ranges region of New South Wales and Queensland form a related group, their T-shaped conductors having very long anterior limbs which also show a trend for increasing distal reflexion.

Cymbium width can vary within species, notably in *T. kiah* and *T. lambkinae*. The epigynal scape varies considerably in shape and size between species. Despite some intraspecific variation (e.g., *T. kiah*: Fig. 4c,e–g) it remains a useful structure for species separation. The epigynal scape is absent in two species. *Therlinya foveolata* has a pit-like, cordate epigynal fossa (Fig. 5c,d) which may be a plesiomorphic state. In *T. bellinger* the scape appears to be reduced and fused into the central epigynal area (Fig. 7c), a highly derived state.

Key to *Therlinya* species

Males

1 Tegular lobe placed basally (Fig. 5a) 2
—— Tegular lobe placed retrolaterally (Fig. 4a) 3

2 RTA placed centrad (Fig. 5b) ..... *T. foveolata*
—— RTA placed dorsad (Fig. 7b) ..... *T. bellinger*

3 RVTA relatively slender. Anterior limb of T-conductor long, more or less reflexed apically; tegular window placed retrobasally (Fig. 10a) 4
—— RVTA relatively thick. Anterior limb of T-conductor shorter, not reflexed apically; tegular window placed probasally to prolaterally (Fig. 4a) 5

4 Conductor only slightly reflexed at tip; retrolateral distal lamina absent (Fig. 9a,b) ..... *T. wiangaree*
—— End of conductor clearly reflexed; retrolateral distal lamina present (Fig. 10a) 6

5 In ventral view RTA completely or largely hidden by RVTA (Figs. 4a) 7
—— In ventral view RTA not hidden by RVTA (Fig. 15a) 8

6 Distal conductor moderately reflexed (Fig. 10a) ..... *T. ballata*
—— Distal conductor strongly reflexed (Fig. 11a) ..... *T. vexillum*

7 Apex of RTA directed retrodorsally (Fig. 14a) ..... *T. angusta*
—— Apex of RTA directed anteriorly (Fig. 4a) 9

8 RTA small (Fig. 8a) ..... *T. horsemanae*
—— RTA large (Fig. 15a) ..... *T. monteithi*

9 Tegular lobe relatively narrow. Beak-like apex of RVTA placed anteriorly (Fig. 13a) ..... *T. lambkinae*
—— Tegular lobe relatively broad. Beak-like apex of RVTA placed posteriorly (Fig. 4a) ..... *T. kiah*

Females

1 Epigynum without scape 2
—— Epigynum with scape 3

2 Epigynum with an open, pit-like fossa (Fig. 5d) ..... *T. foveolata*
—— Epigynum without a fossa; copulatory openings flank a median tuft of setae (Fig. 7c) ..... *T. bellinger*

3 Scape small, apex curved ventrally and knob-like (Figs. 16a,b) ..... *T. nasuta*
—— Scape not as above 4

4 Epigynal scape wide and short, ending at or slightly beyond epigastric furrow 5

—— Epigynal scape longer, ending well beyond epigastric furrow 6

5 Epigynal scape very wide, truncate behind, ending at epigastric furrow (Fig. 8c) ..... *T. horsemanae*

—— Epigynal scape wide, rounded behind, ending just beyond epigastric furrow (Fig. 15c) ..... *T. monteithi*

6 Scape apex relatively wide, truncate or knob-like 7

—— Scape apex relatively narrower, truncate or rounded 8

7 Scape narrowed at middle, distally knob-like (Fig. 9c,e) ..... *T. wiangaree*

—— Scape not as above 9

8 Total width across lateral epigynal fossae less than twice scape width (Fig. 10c) ..... *T. ballata*

—— Total width across lateral epigynal fossae more than twice scape width 10

9 Scape longer than wide (Fig. 11c) ..... *T. vexillum*

—— Scape as long as wide (Fig. 13c) ..... *T. lambkinae*

10 Dorsal part of scape broadened for half or more of scape length (Fig. 4c,e–g) ..... *T. kiah*

—— Dorsal part of scape broadened basally only (Fig. 14c) ..... *T. angusta*

Therlinya kiah n.sp.

Figs. 1a,c–f, 4a–h, 6

Type material. AUSTRALIA: NEW SOUTH WALES—HOLOTYPE: ♂, KS58184 (AMS), 1.5 km W of Kiah, on Towamba road, 37°09'S 149°50'E, 15 Apr. 1978, M.R. Gray, sheet webs in mossy bank along road, matured 26 Nov. 1978. PARATYPES: ♀, KS58185, data as for holotype; ♀, KS58186, data as for holotype; (both mature at collection); ♂, KS34820, 4 mi. S of Rydal on Hampton Road, 33°32'S 150°03'E, 28 Nov. 1974, M.R. Gray; ♀, KS34819, 4 km S of Rydal at Sodwalls-Sydney turn-off, 33°32'S 150°03'E, 28 Nov. 1974, M.R. Gray, in small sheets with tube retreat in tussock grass on bank; ♂, ♀, KS75373, Mt Kaputar NP, 1.9 km W of Bark Hut Campsite, 30°16'50"S 150°07'55"E, 13 Nov. 2001, M. Gray, G. Milledge & H. Smith, sheet webs in grassy earth bank; ♂, KS63025 (to QM), Mount Kembla, Sydney Catchment Authority Reserve, 34°26'33"S 150°44'24"E, 11–15 Dec. 1998, L. Gibson, pitfall traps; ♂ KS70037, Mount Kembla, Sydney Catchment Authority Reserve, 34°26'33"S 150°44'24"E, 6–10 Jun. 1999, L. Gibson, pitfall traps; ♀, KS34822, Blue Mountains NP, 18 km E Woodford, 33°44'S 150°29'E, 17 Apr. 1974, M.R. Gray, vertical sheet web to ground burrow; ♀, KS58188, Brown Mountain, 14 km W of Bemboka, 36°37'S 149°25'E, 16 Apr. 1978, M.R. Gray, large sheet web in bank. AUSTRALIA: VICTORIA—♂, KS69651, ♀, KS58190, Kinglake NP, on SE slopes of Mt Slide, 4 km from SE entrance turn-off, 37°35'S 145°20'E, 29 Mar. 1978, M.R. Gray, in medium sized sheet webs; ♀, KS58192, Fairy Dell Forest Recreation Area, 6 km NW Wiseleigh, 37°41'S 147°47'E, 12 Apr. 1978, M.R. Gray, sheet web 15 cm out from double retreat; ♀, KS58193, between Glen Wills and Sunnyside, 52 km N of Omeo, 36°51'S 147°31'E, 13 Apr. 1974, M.R. Gray, 30 × 25 cm sheet web horizontally out from bank, 8 cm deep retreat.

Other material. AUSTRALIA: NEW SOUTH WALES—5♀♀, KS58187, data as for holotype; ♂, KS34824, Mount Werong near Oberon, 34°05'S 149°56'E, 3 Jul. 1972, G.S. Hunt, under logs; ♂, ♀, KS34829, ♀, KS58194, 8 km E of Bungendore on Braidwood Road, 31°15"S 149°27'E, 11 Dec. 1977, M.R. Gray, dry open sclerophyll, webs among grass on eroded creek banks 5–10 cm burrow; ♂, KS55757, Wiola Creek fire trail, Badja SF, 36°05'56"S 149°35'09"E, 13 Mar. 1999, J. Tarnawski & S. Lassau, CBCR003–025; ♀, KS58189, Bodalla SF, 8 km NNW Central Tilba, near Mt Dromedary turn-off, 36°16'S 150°03'E, 17 Apr. 1978, M.R. Gray, large sheet web suspended out from bank with strong entrance collar; ♂, KS63513, Beecroft Peninsula, northern headland of Jervis Bay, 35°03'03"S 150°47'21"E, 21–25 Aug. 1999, L. Gibson, pitfall traps; ♀, KS58202, Bellinger River SF, NW Thora, 30°25'03"S 152°45'30"E, 12 Nov. 1999, M.R. Gray & H.M. Smith, sheet webs in bank; ♀ KS59583, Bellinger River SF, data as above; ♀♀ KS75353, Bellinger River SF, 22 Nov. 2001, G. Milledge & H. Smith, in earth banks; ♀, KS34821, 2 miles W of Willi Willi on Carrai Rd, 30°56'S 152°27'E, M.R. Gray, 24 Apr. 1974, "*Baiami* type" (sheet) web in moist bank; ♀, KS37191, Boorook SF, Boonoo Boonoo River, 28°48'25"S 152°11'03"E, 18 Feb. 1993, M.R. Gray & G. Cassis, pitfall trap; ♀ KS75371, Mt Kaputar NP, 0.8 km W of Bark Hut Campsite, 30°17'09"S 150°08'12"E, 13 Nov. 2001, M. Gray, G. Milledge & H. Smith, sheet web in grassy earth bank; ♀ KS75372, Mt Kaputar NP, 1.9 km W of Bark Hut Campsite, 30°16'50"S 150°07'55"E, other data as above; ♀♀ KS75374–5, Mt Kaputar NP, 0.8 km W of Coryah Gap, 30°16'44"S 150°07'40"E other data as above; ♀♀ KS75376–7, Mt Kaputar NP, 1.6 km W of Coryah Gap, 30°16'13"S 150°07'11"E, other data as above; ♀♀ KS 75378, Mt Kaputar NP, 0.3 km W of Bark Hut, 30°17'22"S 150°08'24"E, other data as above. AUSTRALIA: QUEENSLAND—♂ QM S42308, Levers Plateau, 28°19'S 152°51'E, 2 Dec. 1991–6 Jan. 1992, D.J. Cook, 720 m, rainforest, pitfall. AUSTRALIA: VICTORIA—♀, KS58191, Kinglake NP, on SE slopes of Mt Slide, 4 km from SE entrance turn-off, 37°35'S 145°20'E, 29 Mar. 1978, M.R. Gray, in medium sized sheet webs; 3♀♀, KS3659, Lind NP, 19 km W of Cann River, Euchre Valley Road, 37°35'S 148°57'E, 24 Mar. 1978, M.R. Gray, sheet webs; ♀, KS3648, Alfred NP, 2 km W Governors Bend pull-in, 37°33'S 149°21'E, 23 Mar. 1978, M.R. Gray, roadside bank below rainforest, sheet webs c. 25 cm long; ♀, KS45206, Buchan Caves Reserve, 37°30'S 148°15'E, 25 Mar. 1978, M.R. Gray.

Diagnosis. CL 2.90–5.00. Separated from other females by large width across paired epigynal fossa (twice scape width) and broadened dorsal part of scape; from north Queensland species by presence of obvious leg banding; and from other males by the wide cymbium and bulb.

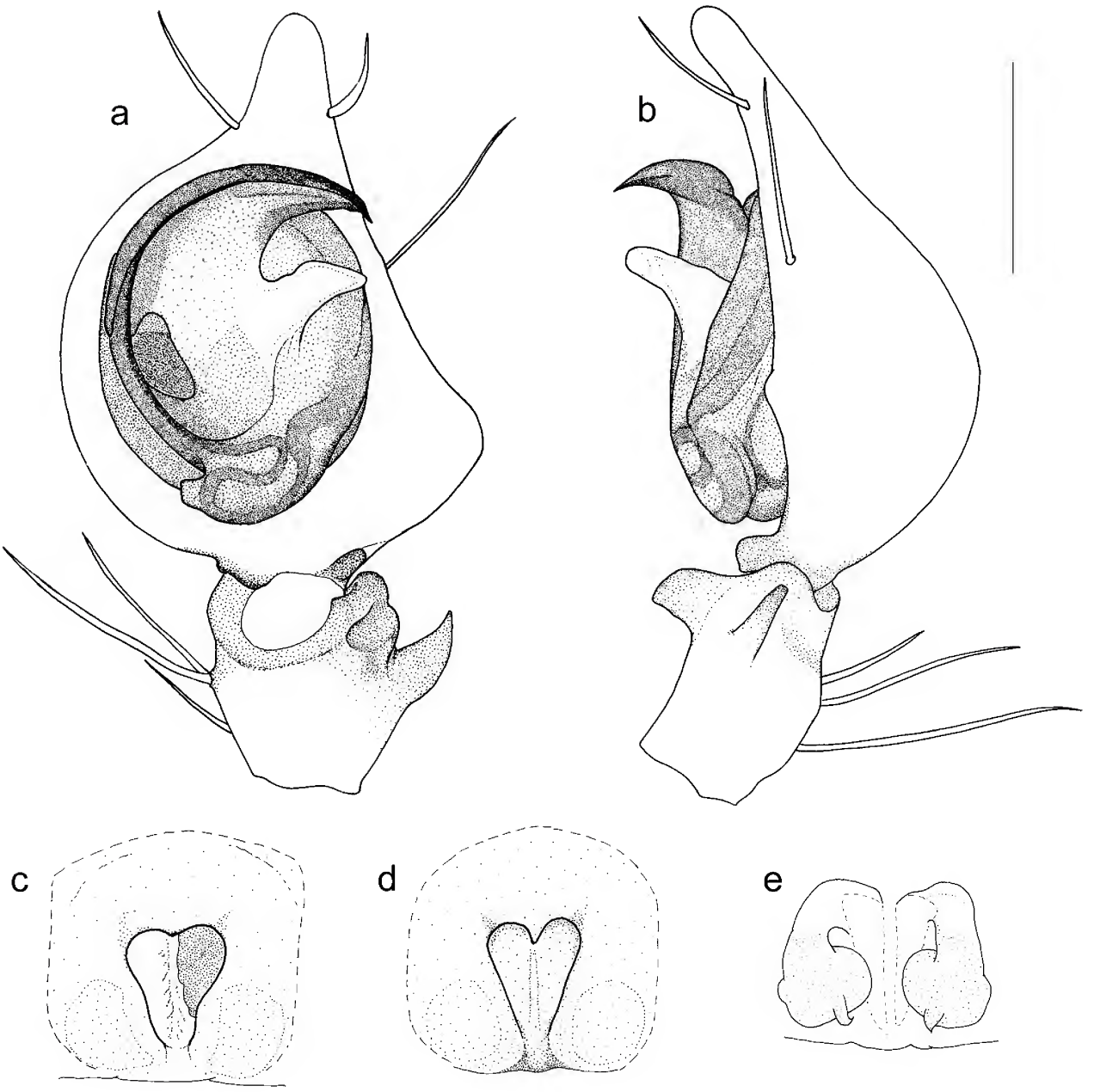

Figure 5. *Therlinya foveolata*. a,b, male palp (holotype): a, ventral; b, retrolateral; c–e, epigynum: c,d, ventral (c: plug on LHS); e, dorsal—internal genitalia. Scale line 0.5 mm. (c, KS34794; d, KS34797; e, KS34795).

Male (holotype). BL 7.47, CL 3.59 (3.35–4.78), CW 2.45, CapW 1.35, EGW 0.96, LL 0.47, LW 0.49, SL 1.75, SW 1.45. Legs: 1423 (I 13.88, II 12.12, III 10.12, IV 12.24); ratio tibia I length:CW = 1:0.74. Male palp: Fig. 4a,b. Cymbium wide with strongly developed retrolateral flange. Bulb wide with large, rounded tegular lobe placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor prolaterally directed, posterior limb placed prolaterally; tegular window large, placed basally. RTA apophysis dorsad, hidden in ventral view; RVTA broad, beak-like apex turned toward lower side in ventral view.

Female (KS58185). BL 7.39, CL 3.51 (2.90–5.00), CW 2.04, CapW 1.76, EGW 1.04, LL 0.53, LW 0.53, SL 1.51, SW 1.31. Standard colour pattern. Legs: 1423 (I 11.50, II 10.00, III 8.17, IV 10.17); ratio tibia I length:CW = 1:0.72. Epigynum: Fig. 4c–g. Scape moderately long, dorsobasal part of scape markedly broadened for half or more of scape length, with most of scape length placed in front of epigastric groove; ventral scape width varies from narrow to moderately broad; sides more or less parallel or, if divergent, scape relatively narrow; in side view distoventral scape protuberant; epigynal fossae oriented vertically. Internal genitalia: Fig. 4h.

Variation. There is a noticeable variation in body size (including male palp size) which appears to be seasonal. Specimens collected as adults in late summer–winter are medium–large, whereas those from spring–early summer are small–medium in size. Despite the individual variation observed in characters such as scape shape and palpal width, the overall pattern is one of a single, widely distributed but variable species.

Distribution. Eastern New South Wales and eastern Victoria. The only record of *Therlinya* from Tasmania (female, KS29134, Punchbowl, Launceston) may belong to this species but more material, including males, is needed before a definite species allocation is made.

Etymology. The specific name is taken from the type locality and is an Aboriginal word meaning "a beautiful place".

Therlinya foveolata n.sp.

Figs. 5a–e, 6

Type material. AUSTRALIA: VICTORIA—HOLOTYPE: ♂, KS34792 (AMS), near Delley's Dell turn-off, Silverband Road, Grampian Ranges, 37°11'S 142°31'E, 24 Mar. 1974, M.R. Gray, collected as juvenile, matured Apr. 1974. PARATYPES: ♀, KS34793, data as for holotype, adult coll.; ♀, KS34797, Stony Creek Bridge, near Hall's Gap, Grampian Ranges, 37°09'S 142°30'E, 21 Mar. 1974, M.R. Gray; 4♀♀, KS34795, 8 km SW of Hall's Gap on Silverband Road, Grampian Ranges, 37°11'S 142°31'E, 24 Mar. 1974, M.R. Gray; ♀, KS34796; ♀, KS34794, with 60 young; both data as for KS34795.

Other material. AUSTRALIA: VICTORIA—♀, KS73046, 10 km S of Forrest on Forrest–Apollo Bay Rd, Otway Ranges, 38°35'S 143°43'E, 31 Mar. 1978, M.R. Gray, in road bank—regrowth Stringybark forest above, in large sheet web, c. 35×15 cm curving up & out from bank retreat.

Diagnosis. CL 3.71–4.08. Separated from all other species by the pit-like epigynal fossa and centrad placement of the RTA.

Male (holotype). BL 7.71, CL 3.71, CW 2.47, CapW 1.53, EGW 1.03, LL 0.59, LW 0.50, SL 1.75, SW 1.49. Legs: 1423 (I 15.05, II 13.42, III 11.04, IV 13.89); ratio tibia I length:CW = 1:0.72. Male palp: Fig. 5a,b. Cymbium wide with well-developed retrolateral flange. Bulb longer than wide with tegular lobe placed basally. Embolus origin basal. Stem of T-shaped conductor anteriorly directed, posterior limb placed retrolaterally; tegular window small, prolateral. RTA large, centrad, and visible in ventral view; RVTA with broad, beak-like apex.

Female (KS34794). BL 7.67, CL 3.96 (3.96–4.08), CW 2.55, CapW 2.00, EGW 1.14, LL 0.63, LW 0.59, SL 1.82, SW 1.44. Standard colour pattern. Legs: 1423 (I 13.24, II 11.20, III 9.40, IV 11.60); ratio tibia I length:CW = 1:0.79. Epigynum: Fig. 5c,d. Cordate, unpaired, central fossa with copulatory openings placed at anterolateral corners and opening posteromedially. Scape absent to rudimentary, probably represented by a midline cusp on the anterior epigynal margin. Internal genitalia: Fig. 5e. Copulatory ducts short.

Distribution. Grampian and Otway Ranges, Victoria.

Comments. The Otway Range spiders may prove to be a separate species from the Grampian spiders but this will not be resolved until Otway males are available.

Etymology. The specific name refers to the pit-like epigynal fossa, unique within this genus.

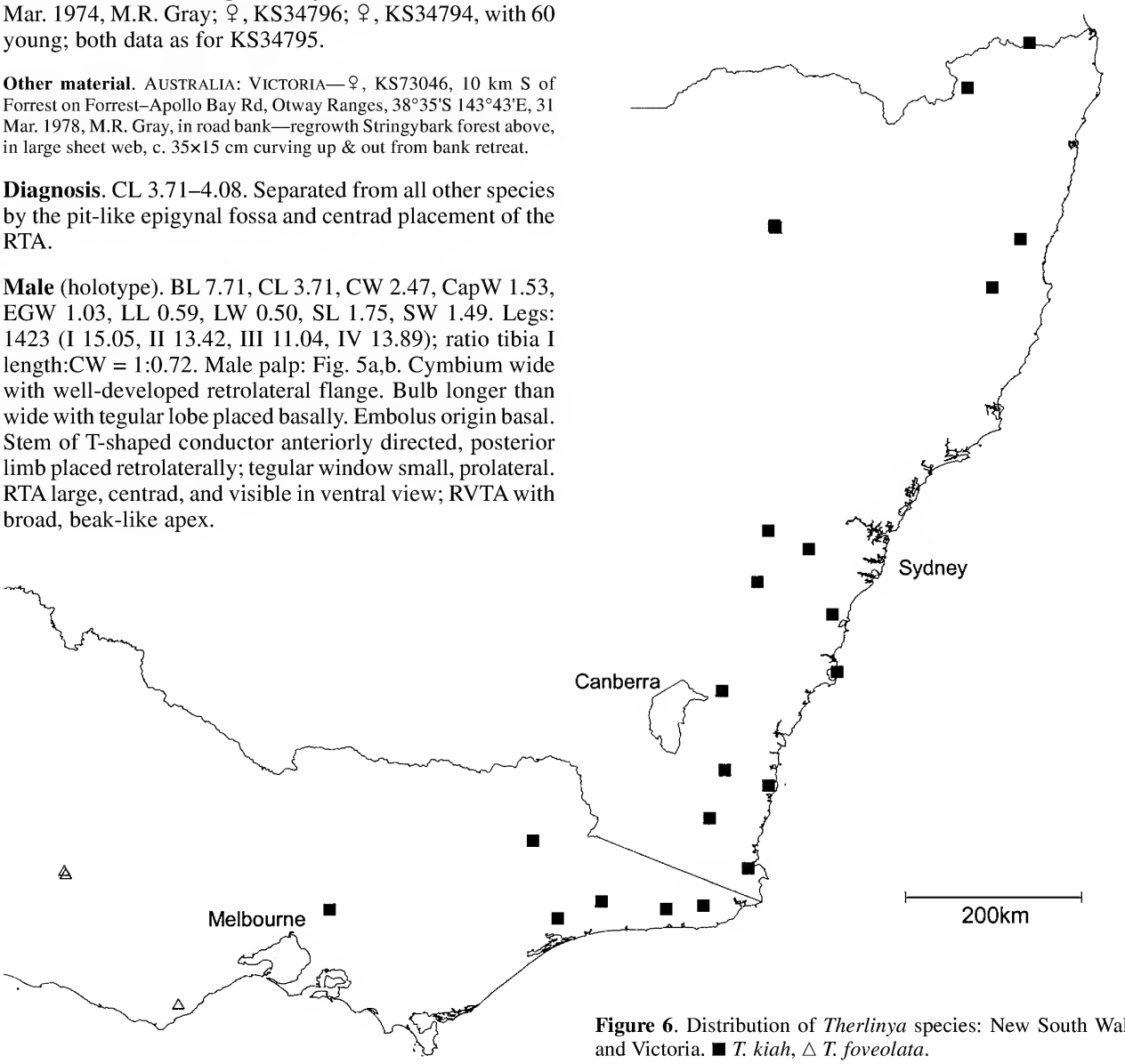

Figure 6. Distribution of *Therlinya* species: New South Wales and Victoria. ■ *T. kiah*, △ *T. foveolata*.

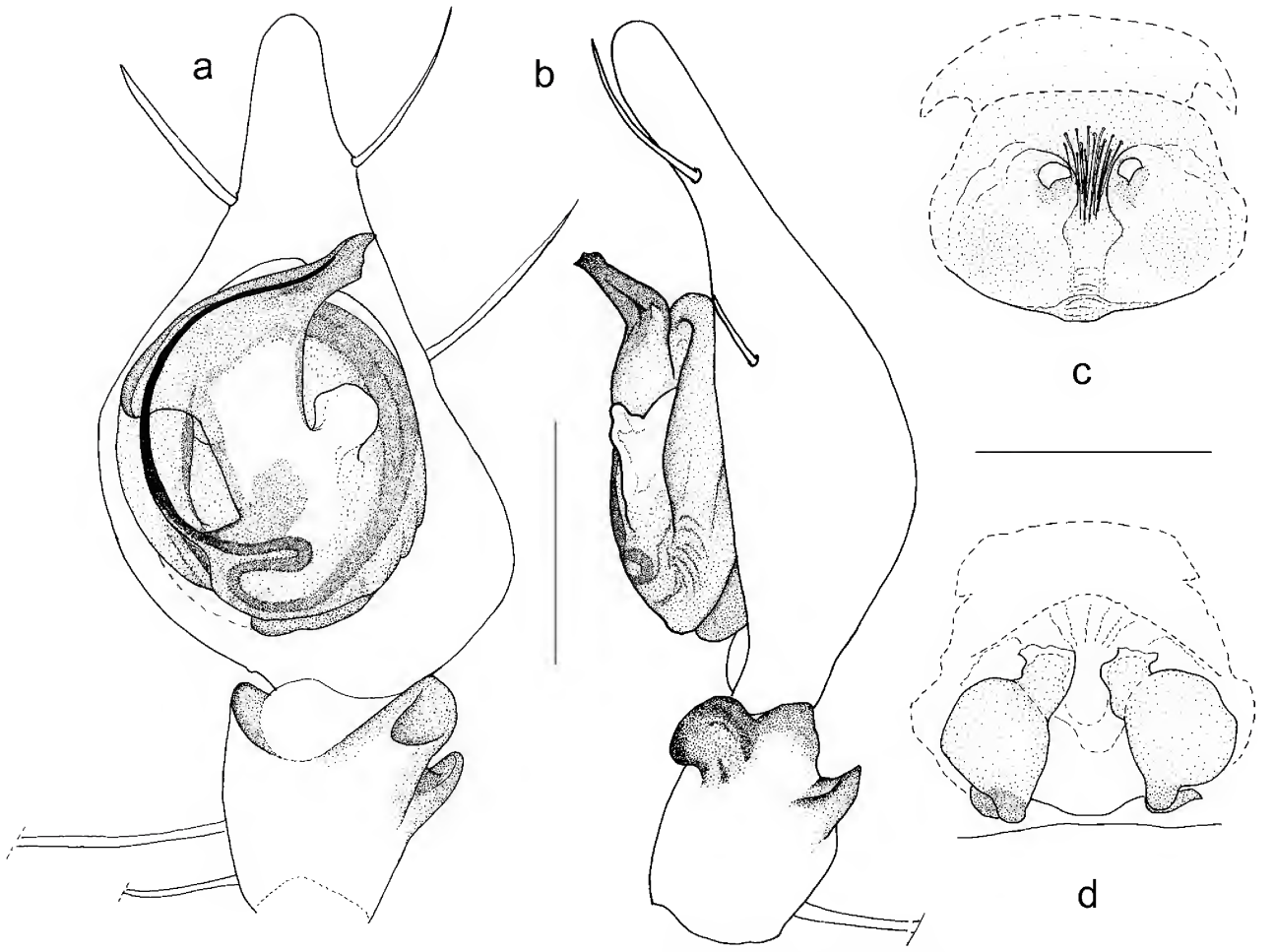

Figure 7. *Therlinya bellinger*. a,b, male palp (holotype): a, ventral, b; retrolateral. c–d, epigynum: c, ventral; d, dorsal—internal genitalia (c, KS59584; d, KS60711). Scale lines 0.5 mm: vertical, a,b; horizontal, c,d.

Therlinya bellinger n.sp.

Figs. 7a–d, 12

Type material. AUSTRALIA: NEW SOUTH WALES—HOLOTYPE: ♂, KS60708 (AMS), Bellingen area, Horseshoes Rd c. 1.5 km NNE Killiecrankie Mountain, 30°31'22"S 152°32'59"E, M.R. Gray, 11 Nov. 1999, ex earth bank as juvenile, matured early Jan. 2000. PARATYPES: ♀, KS59584, data as holotype except mature with eggsac in retreat; ♀, KS60711, Bellinger River SF, NW Thora, 30°25'03"S 152°45'30"E, 12 Nov. 1999, M.R. Gray & H.M. Smith, sheet web in bank.

Diagnosis. CL 3.92–4.20. Separated from all species except *T. foveolata* by basal position of tegular lobe and the absence of an epigynal scape; from *T. foveolata* by the dorsal position of the RTA and the absence of a pit-like epigynal fossa.

Male (holotype). BL 8.21, CL 3.92, CW 2.65, CapW 1.76, EGW 1.08, LL 0.65, LW 0.55, SL 1.84, SW 1.51. Legs: 1423 (I 16.90, II 14.49, III 12.20, IV 14.90); ratio tibia I length:CW = 1:0.64. Male palp: Fig. 7a,b. Cymbium with moderately developed retrolateral flange. Bulb longer than wide, tegular lobe basal. Embolus origin probasal. Stem of T-shaped conductor anteriorly directed, posterior limb prolateral-apical, anterior limb gently curved upward; tegular window prolateral. RTA dorsad, visible in ventral view; RVTA moderately long with broad, beak-like apex.

Female (KS59584). BL 8.61, CL 3,92 (3.92–4.20), CW 2.65, CapW 1.84, EGW 1.12, LL 0.63, LW 0.63, SL 1.73, SW 1.45. Standard colour pattern. Legs: 1423 (I 13.83, II 11.67, III 9.75, IV 12.08); ratio tibia I length:CW = 1:0.77. Epigynum (Fig. 7c) without scape or fossa, sclerotised with a median, slightly depressed area, and two anterior copulatory openings separated by a low hair-tufted prominence. Internal genitalia (Fig. 7d) with extremely short copulatory ducts.

Distribution. Bellingen region, northern New South Wales.

Etymology. The specific name is a noun in apposition referring to the type locality.

Therlinya horsemanae n.sp.

Figs. 8a–f, 12

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♂, KS58196 (AMS), Bulburin Forestry Nursery, NW of Bundaberg, 24°31'S 151°29'E, 22 Mar. 1975, M.R. Gray & C. Horseman, sheet webs on roadside bank. PARATYPES: ♀, KS58199, data as for holotype; ♀, KS58197, ♂, KS58198, ♀ KS71038, data as for holotype, except 21 Mar. 1975; ♂, KS69652, ♀, KS34798, Bulburin Forestry Area, 24°34'S

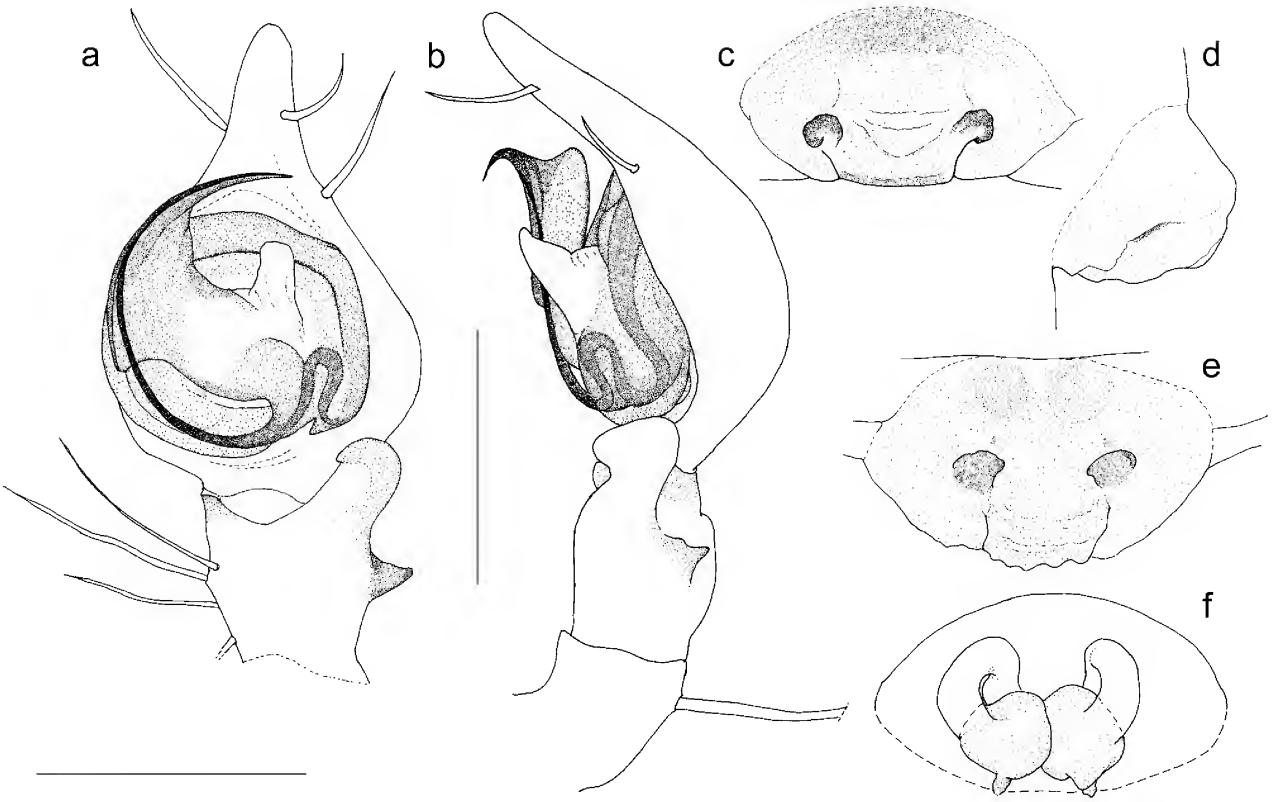

Figure 8. *Therlinya horsemanae*. a,b, male palp (holotype): a, ventral; b, retrolateral. c–f, epigynum (KS58197): c, ventral; d, lateral; e, posterior; f, dorsal—internal genitalia. Scale lines 0.5 mm: vertical, a,b; horizontal, c–f.

151°29'E, 22 Mar. 1975, M.R. Gray & C. Horseman, 580 m, bank beside road; ♂, QM S45529, data as for holotype.

Diagnosis. CL 2.53–3.67. Separated from other species by possession of a short, broad scape, widely truncated at level of epigastric groove; and by the slender, apically pointed, distal conductor.

Male (holotype). BL 5.96, CL 2.78 (2.53–2.98), CW 1.92, CapW 1.18, EGW 0.82, LL 0.41, LW 0.39, SL 1.31, SW 1.20. Legs: 1243 (I 14.82, II 13.55, III 10.53, IV 13.02); ratio tibia I length:CW = 1:0.50. Male palp: Fig. 8a,b. Cymbium with moderately developed retrolateral flange. Bulb subcircular with retrolaterally placed tegular lobe. Embolus origin basal. Stem of T-shaped conductor prolaterally directed, posterior limb placed prolaterally; tegular window placed basally. RTA weakly dorsad, visible in ventral view; RVTA moderately long, with beak-like apex turned toward upper side in ventral view.

Female (KS58197). BL 7.51, CL 3.67 (3.06–3.67), CW 2.29, CapW 1.73, EGW 1.08, LL 0.57, LW 0.55, SL 1.73, SW 1.45. Standard colour pattern. Legs: 1423 (I 13.55, II 11.47, III 9.47, IV 11.84); ratio tibia I length:CW = 1:0.66. Epigynum: Fig. 8c–e. Scape short and broad, not extended beyond epigastric groove; in side view distoventral scape protuberant; epigynal fossae narrow, oriented horizontally. Internal genitalia: Fig. 8f.

Distribution. Recorded only from the type locality near Bundaberg, Queensland.

Etymology. The specific name is in recognition of Christine Horseman, former Technical Officer in Arachnology at the Australian Museum.

Therlinya wiangaree n.sp.

Figs. 9a–f, 12

Type material. AUSTRALIA: NEW SOUTH WALES—HOLOTYPE: ♂, KS34826 (AMS), Wiangaree SF, 28°23'S 153°06'E, 16 Oct. 1974, M.R. Gray. PARATYPES: 2♀♀, KS58449, KS34827, 5♀♀, KS34825; data as for holotype; ♀, KS35944, Border Ranges NP, Tweed Range Rd, 500 m N of Sheepstation Creek track, 28°24'51"S 153°01'39"E, 18 Feb. 1993, M.R. Gray & G. Cassis, pit trap; ♀, QM S42314, Richmond Range, 18 Apr. 1976, R. Raven. AUSTRALIA: QUEENSLAND—1♂, 1♀, QM S42303, Binna Burra, 28°12'S 153°12'E, 7 Jan. 1977, B.J. & M. Marples, V.E. Davies; ♂♂, ♀♀, QM S42302, Lamington National Park, 28°14'S 153°08'E, 20–30 Mar. 1975, R. Raven, sheet web, spider runs on ventral surface into tube going into bank beside path; ♂, QM S42307, Springbrook, north end, 28°12'S 153°16'E, 30 Aug–31 Oct. 1997, G. Monteith, open forest, 550 m, pitfall trap.

Other material. AUSTRALIA: QUEENSLAND—1♂, 3♀♀, QM S42301, Binna Burra, 28°12'S 153°12'E, 30 Mar. 1976, R. Raven, V.E. Davies, sheet web; ♀, QM S42305, Binna Burra, 13 Mar. 1997, Monteith & Russell, rainforest, 800 m, sieved leaf litter; ♀, QM S42309, O'Reilly's, Lamington National Park, 28°14'S 153°08'E, 15 Nov. 1977, E. Dahms, V.E. Davies & R. Raven, sheet webs; ♀, QM S42304, Lamington, 28°15'S 152°58'E, 13 Apr. 1974, R. Raven, in sheet web with ventral retreat; ♀♀, QM S42310, Lamington NP, 9 Jul. 1977, R Raven, sheet web; ♀, QM S42312, Lamington, 22 Jun. 1974, R. Raven, on under side of sheet web, back to funnel under bank; ♀, S42306, O'Reilly's, Lamington NP, 25–6 Sep. 1986, J. Gallon, R.J. Raven; ♀♀, QM S42311, Nagarigoon, 28°11'S 153°11'E, 1 Apr. 1976, V.E. Davies, sheet web with retreat to bank; ♀, QM S42313, Witches Falls, Mt Tamborine, 27°55'S 153°10'E, 3 May 1981, V.E. Davies, sheet web under rock.

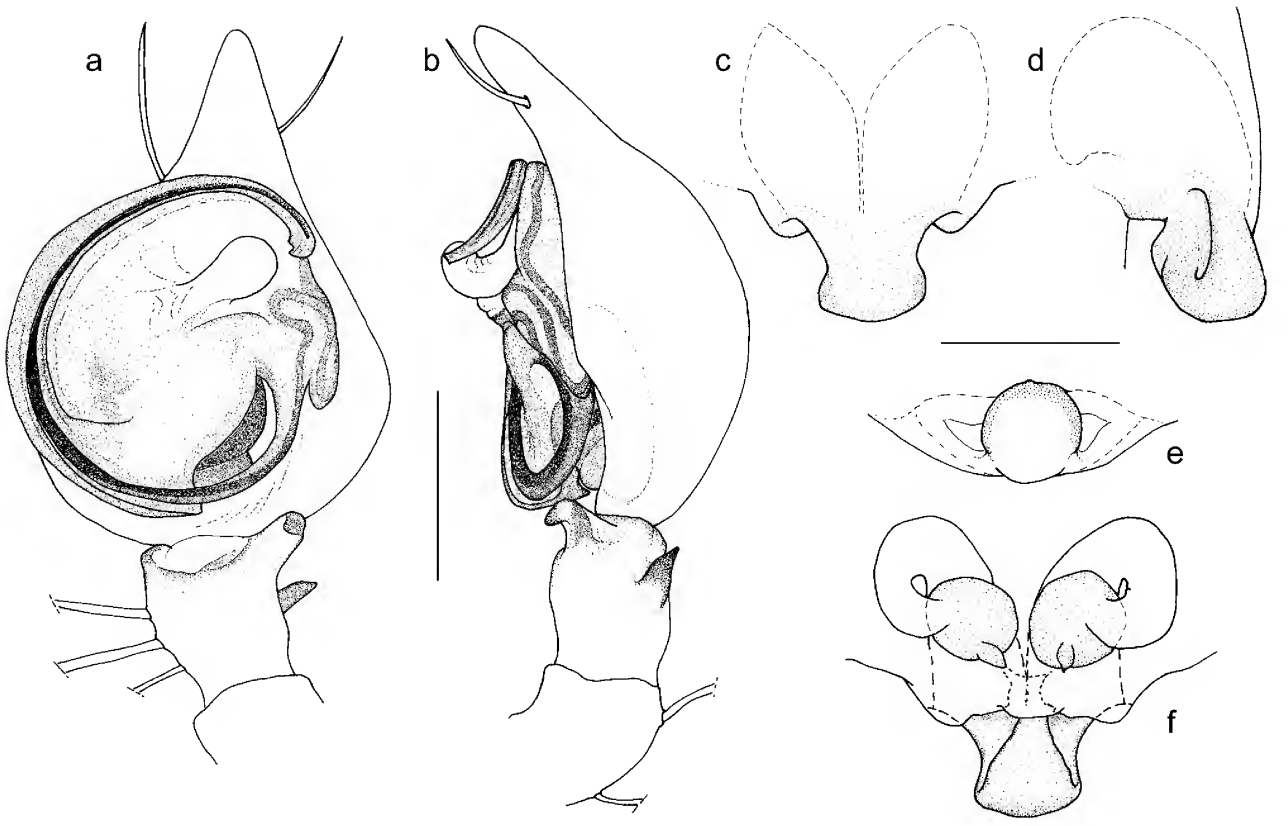

Figure 9. *Therlinya wiangaree*. a,b, male palp (holotype): a, ventral; b, retrolateral. c–f, epigynum (KS52449): c, ventral; d, lateral; e, posterior; f, dorsal—internal genitalia. Scale lines 0.5 mm: vertical, a,b; horizontal, c–f.

Diagnosis. CL 2.78–3.80. Separated from all species by the combination of relatively narrow width across the anterior fossae compared to width of distal scape, and rounded appearance of scape end in posterior view; from all species except *T. ballata* and *T. vexillum* by the retrobasal position of the tegular window; and from these species by the lack of a marked reflexion of the distal conductor.

Male (holotype). BL 6.86, CL 3.31 (2.78–3.39), CW 2.24, CapW 1.43, EGW 0.96, LL 0.51, LW 0.43, SL 1.55, SW 1.39. Legs: 1243 (I 15.18, II 13.27, III 10.78, IV 13.22); ratio tibia I length:CW = 1:0.58. Male palp: Fig. 9a,b. Cymbium with moderately developed retrolateral flange. Bulb longer than wide with tegular lobe placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor probasally directed; anterior limb long, apically relatively narrow with slight reflexion only; posterior limb placed basally; tegular window small, placed retrolaterally. RTA dorsad, largely visible in ventral view; RVTA relatively slender.

Female (KS58449). BL 7.55, CL 3.47 (3.47–3.80), CW 2.24, CapW 1.67, EGW 1.00, LL 0.51, LW 0.49, SL 1.57, SW 1.41. Standard colour pattern. Legs: 1423 (I 12.12, II 10.08, III 8.41, IV 10.37); ratio tibia I length:CW = 1:0.72. Epigynum: Fig. 9c–e. Scape of medium length, mostly placed behind epigastric groove; ratio width across anterior fossae to scape width at narrowest < 2.5:1; sides of scape slightly to deeply concave; end of scape truncate to convex; rounded and sometimes bulbous in posterior view; distoventral scape protuberant in side view; epigynal fossae vertical. Internal genitalia: Fig. 9f.

Distribution. Border Ranges area of northeastern New South Wales and southeastern Queensland.

Variation. Epigynal scapes vary from the example figured with highly concave sides (Fig. 9c) to a shape very similar to *T. vexillum* (Fig. 11c). The combination of characters given in the diagnosis will suffice to separate these species.

Etymology. The specific name is taken from the type locality which is an Aboriginal word meaning "a pine ridge".

Therlinya ballata n.sp.

Figs. 10a–f, 12

Type material. AUSTRALIA: NEW SOUTH WALES—HOLOTYPE: ♂, KS34842 (AMS), Cherry Tree North SF, SW of Casino, 28°54'S 152°45'E, Apr. 1976, M.R. Gray & C. Horseman. PARATYPES: ♀, KS58201, data as for holotype; ♂, KS57681, Acacia Plateau & Wilson's Peak area, Koreelah SF, 28°16'S 152°27'E, 12 Dec. 1988, Smith, Hines, Pugh & Webber, Focal Peak Survey, trap AP5; ♂, KS57683, Cambridge Plateau, Richmond Range SF, 28°47'S 152°45'E, 17 Dec. 1988, Smith, Hines, Pugh & Webber, Focal Peak Survey, trap CP9; ♀, KS37198, Boorook SF, 1 km NW Boorook Creek junction on Conlongan Rd, 28°51'24"S 152°11'27"E, 18 Feb. 1993, M.R. Gray & G. Cassis, pit-traps, site 09BM.

Diagnosis. CL 2.65–3.75. Separated from all species by the asymmetric shape of the epigynal fossae; and from most species by the partial reflexion of the end of the conductor, except *T. vexillum* in which reflexion is stronger.

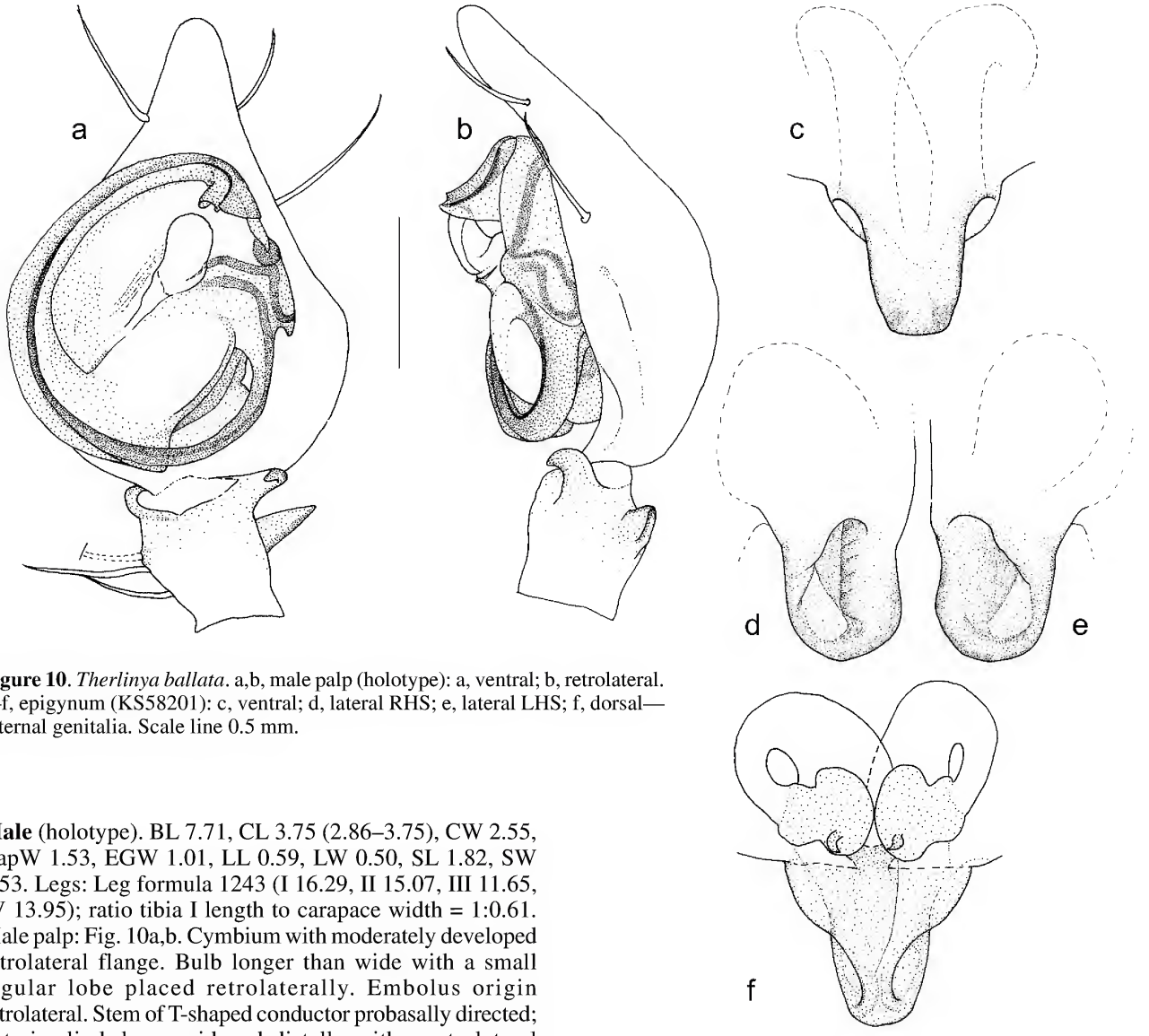

Figure 10. *Therlinya ballata*. a,b, male palp (holotype): a, ventral; b, retrolateral. c–f, epigynum (KS58201): c, ventral; d, lateral RHS; e, lateral LHS; f, dorsal—internal genitalia. Scale line 0.5 mm.

Male (holotype). BL 7.71, CL 3.75 (2.86–3.75), CW 2.55, CapW 1.53, EGW 1.01, LL 0.59, LW 0.50, SL 1.82, SW 1.53. Legs: Leg formula 1243 (I 16.29, II 15.07, III 11.65, IV 13.95); ratio tibia I length to carapace width = 1:0.61. Male palp: Fig. 10a,b. Cymbium with moderately developed retrolateral flange. Bulb longer than wide with a small tegular lobe placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor probasally directed; anterior limb long, widened distally with a retrolateral lamina and partially reflexed; posterior limb placed basally; tegular window small, placed retrolaterally. RTA dorsad, visible in ventral view; RVTA relatively slender with small beak-like apex.

Female (KS58201). BL 7.96, CL 3.60 (2.65–3.60), CW 2.29, CapW 1.71, EGW 1.03, LL 0.58, LW 0.52, SL 1.67, SW 1.31. Standard colour pattern. Legs: 1423 (I 12.84, II 10.80, III 9.13, IV 11.45); ratio tibia I length:CW = 1:0.70. Epigynum: Fig. 10c–e. Scape relatively long, mostly placed behind epigastric groove; moderately broad with sides gradually narrowing distally; in side view distoventral scape weakly protuberant. Epigynal fossae vertical but their shapes are somewhat distorted due to internal overlap and displacement of proximal copulatory ducts. Internal genitalia: Fig. 10f. Copulatory ducts very broad and overlapping proximally, so that the inner walls of the epigynal fossae are displaced relative to each other (Fig. 10d–f).

Distribution. Northeastern New South Wales.

Etymology. The specific name is an Aboriginal word for the native cherry tree and is a reference to the type locality.

Therlinya vexillum n.sp.

Figs. 11a–f, 12

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♂, KS34817 (AMS), Mount Glorious, 27°20'S 152°46'E 18 Nov. 1974, M.R. Gray, rainforest. PARATYPES: 2♀♀, KS58200, KS34818, data as for holotype; ♂, QM S42315, Enoggera Reservoir, 27°27'S 152°55'E, 16 Oct.–4 Nov. 1999, C.J. Burwell, 100 m, rainforest, site 3, malaise trap; 2♀♀, QM S42317, Mt Glorious NP, 6 Jan. 1977, B.J. & M.J. Marples, R. Raven, V.E. Davies; 2♂♂, 2♀♀, QM S42319 Booloumba Ck, Conondale Range, c. 26°39'S 152°39'E, 13–18 Apr. 1976, R. Raven.

Other material. AUSTRALIA: QUEENSLAND—♂ KS69688, Brisbane Forest Park, 27°25'04"S 152°49'48"E, 23–28 Nov. 1997, N. Power, malaise trap; ♂ KS69484, Brisbane Forest Park, 27°25'05"S 152°50'13"E, 30 Mar.–4 Apr. 1998, N. Power, malaise trap, creek; ♀, QM S42318, Mt Glorious, 15 Feb.–25 Mar. 1983, A. Hiller, malaise trap; ♂, QM S42316, Brookfield, 27°30'S 152°55'E, 9 Nov. 1975–27 Feb. 1976, G.B. & S.R. Monteith, 110 m, pitfall trap.

Diagnosis. CL 2.78–4.00. Separated from all species by very strong reflexion of the distal conductor; and by the combination of the relatively broad width across the

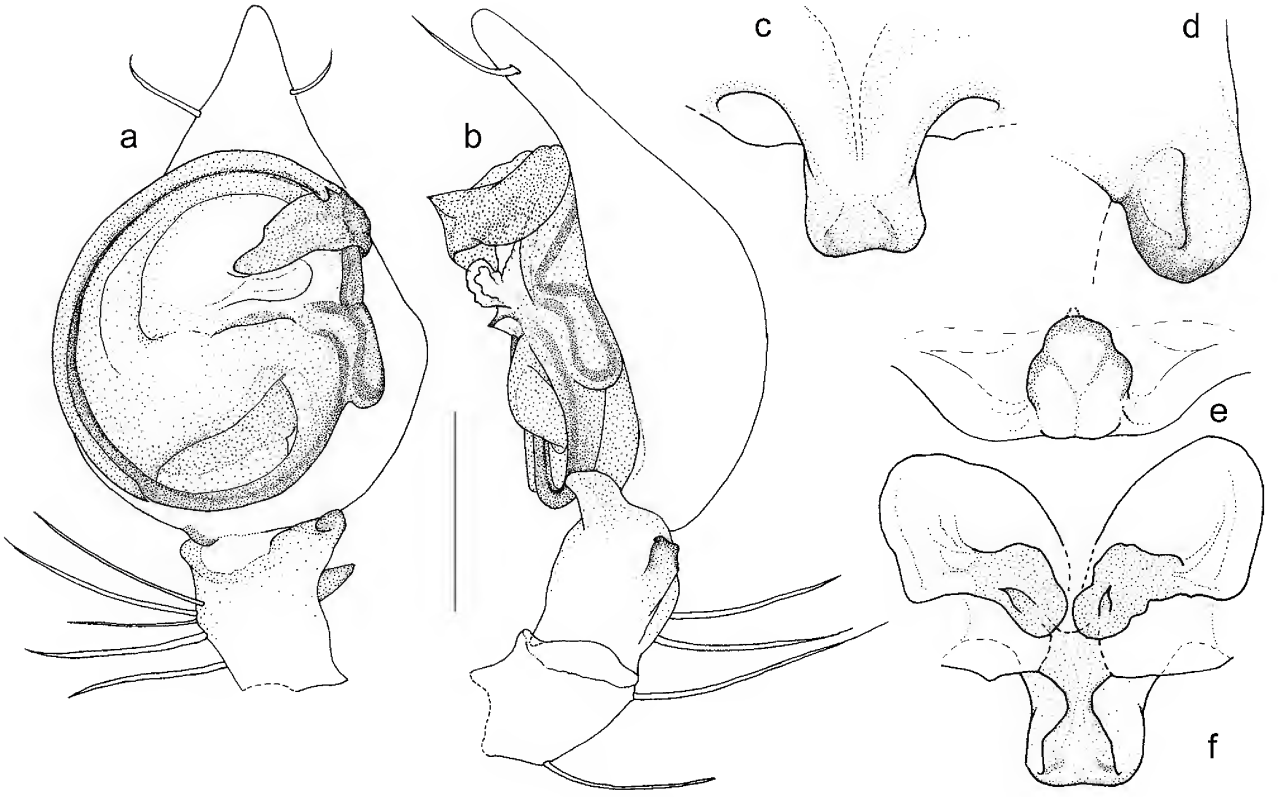

Figure 11. *Therlinya vexillum*. a,b, male palp (holotype): a, ventral; b, retrolateral. c–f, epigynum (KS34818): c, ventral; d, lateral; e, posterior; f, dorsal—internal genitalia. Scale line 0.5 mm.

epigynal fossae compared to width of distal scape, and lobed appearance of the scape in posterior view.

Male (holotype). BL 5.75, CL 2.91 (2.91–3.92), CW 2.07, CapW 1.24, EGW 0.83, LL 0.45, LW 0.43, SL 1.45, SW 1.24. Legs: 1243 (I 13.89, II 12.29, III 9.56, IV 12.04); ratio tibia I length:CW = 1:0.59. Male palp: Fig. 11a,b. Cymbium with moderately developed retrolateral flange. Bulb longer than wide with the tegular lobe placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor probasally directed; anterior limb long, strongly expanded distally and fully reflexed; posterior limb placed probasally; tegular window placed retrobasally. RTA dorsad, largely visible in ventral view; RVTA relatively slender towards apex.

Female (KS58200). BL 6.84, CL 3.02 (2.78–4.00), CW 1.98, CapW 1.42, EGW 0.88, LL 0.49, LW 0.45, SL 1.46, SW 1.21. Standard colour pattern. Legs: 1423 (I 11.02, II 9.13, III 7.49, IV 9.40); ratio tibia I length:CW = 1:0.72. Epigynum: Fig. 11c–e. Scape relatively long, mostly placed behind epigastric groove; sides weakly concave to parallel; end of scape truncate or slightly indented, and lobate in posterior view; ratio of width across anterior ends of epigynal fossae to scape width at narrowest point > 2.5:1; in side view distoventral scape weakly protuberant; epigynal fossae vertical. Internal genitalia: Fig. 11f.

Variation. Specimens from the Conondale Ranges are larger and the reflexed end of the conductor is broader than in other specimens.

Distribution. The Brisbane area of southeast Queensland and northwards to the Conondale Ranges.

Etymology. The specific name refers to the extended, reflexed tip of the conductor in the male palpus and means "banner" or "flag" (L.).

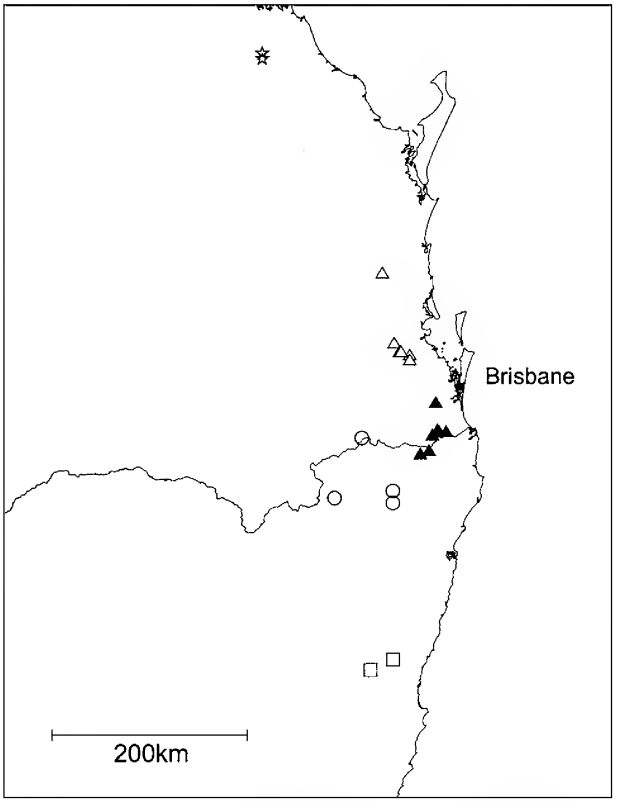

Figure 12. Distribution of *Therlinya* species: northern New South Wales and southeast Queensland. ▲ *T. wiangaree*, △ *T. vexillum*, ☆ *T. horsemanae*, ○ *T. ballata*, □ *T. bellinger*.

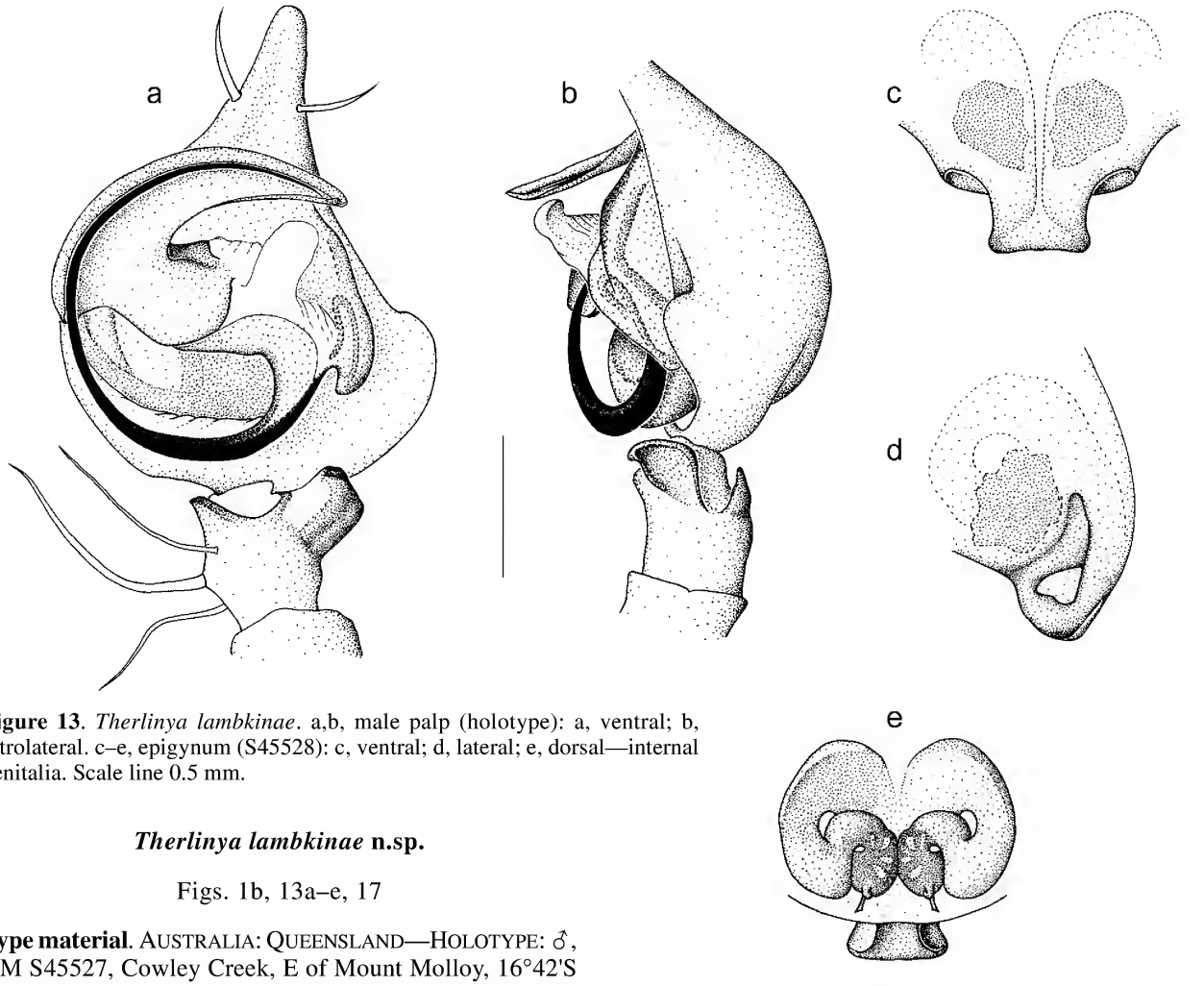

Figure 13. *Therlinya lambkinae*. a,b, male palp (holotype): a, ventral; b, retrolateral. c–e, epigynum (S45528): c, ventral; d, lateral; e, dorsal—internal genitalia. Scale line 0.5 mm.

Therlinya lambkinae n.sp.

Figs. 1b, 13a–e, 17

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♂, QM S45527, Cowley Creek, E of Mount Molloy, 16°42'S 145°23'E, 3–10 Nov. 1975, R. Raven & V.E. Davies, lacy web with retreat to rotting logs. PARATYPES: ♀, QM S45528, data as for holotype; ♂, 2♀♀, QM S42260, data as for holotype; ♀, KS58323, ♂, KS58324, Goldsborough Valley SF, 4.1 km S of Mulgrave River crossing, 17°14'S 145°46'E, 23 May 2000, G. Milledge & H.M. Smith, rainforest, sheet webs out from retreats in almost vertical earth bank on roadside; ♀, KS4166, Mt Lewis, 16°35'S 145°17'E, 19 Aug. 1978, R. Mascord; ♀, KS34799, Gordonvale–Atherton Rd, just S of Lake Barrine turn-off, 17°15'S 145°38'E, 16 Nov. 1975, M.R. Gray, medium-size sheet web woven among leaf litter and going into bank hole c. 4 cm deep, ♀ with round egg sac attached to roof; ♂, KS42608, Mt Spurgeon, 16°26'S 145°12'E, 19 Apr. 1994, M. Moulds & J. Thompson, eucalypt forest, messy platform above retreat under log; ♂, KS58325, ♀, KS58326, Goldsborough Valley SF, c. 1.5 km N of campsite, 17°14'S 145°46'E, 22 May 2000, G. Milledge & H.M. Smith, rainforest, sheet webs out from retreats in almost vertical earth bank on roadside; ♂, KS58327, Cape Kimberley Rd, 2.7 km from Cape Tribulation Rd, 16°15'58"S 145°27'35"E, 20 May 2000, G. Milledge & H.M. Smith, in rotting log; ♂♂, QM S14104, Paluma Dam Rd, 19°00'S 146°10'E, 2 Sep. 1988, R. Raven, J. Gallon & T. Churchill, fringe rainforest; ♂, QM S16725, Mossman Bluff track, 5–10 km W of Mossman, 16°27'S 145°18'E, 20 Dec. 1989–15 Jan. 1990, Monteith, Thompson & ANZSES, 760 m, site 5 flight intercept; ♂, QM S17862, Mt Elliot, summit, 19°30'S 146°57'E, 26 Mar. 1991, G. Monteith & D. Cook, 1150 m.

Other material. AUSTRALIA: QUEENSLAND—♀, QM S17874, Mt Elliot, North Creek, 19°29'S 146°57'E, 25–27 Mar. 1991, G. Monteith & D. Cook, 1000 m; ♀, QM S24424, Mt Halifax, 19°07'S 145°23'E, 19–21 Mar. 1991, G. Monteith & D. Cook, E/W ridge, 900 m; ♂, ♀, QM S42261, Mt Lewis, 12 Sep. 1971, N. Clyde-Coleman; ♀, QM S42267, Mossman Bluff track, 9 km W of Mossman, 16°27'S 145°17'E, 20–24 Dec. 1989, Monteith, Thompson & ANZSES, 1000 m; ♂, QM S42268, Mossman Bluff track, 5–10 km W of Mossman, 16–30 Dec. 1988, Monteith, Thompson & ANZSES, 1000 m, site 7, flight intercept; ♀, QM S42273, Emerald Creek, Lamb Range, c. 17°04'S 145°35'E, 11 Oct. 1982, Monteith, Yeates & Thompson, 950 m; ♀, QM S42280, en route to Flat Peak, Cape Tribulation Rd, 16°15'S 145°25'E, 27 Jul. 1991, T. Churchill, 400 m; ♂♂, QM S42284, 3 km S Mt Spurgeon, 16°27'S 145°11'E, 20–22 Nov. 1997, D.J. Cook, 1100 m, pitfall traps, open forest; ♂, QM S42285, Mt Spurgeon, 16°27'S 145°12'E, 19 Nov. 1997–8 Feb. 1998, Monteith & Cook, 1120 m, O/F trap 5, pitfall; ♂♂, QM S42286, Mt Spurgeon, 16°28'S 145°12'E, 19 Nov. 1997–8 Feb. 1998, Monteith & Cook, 1110 m, O/F trap 6, pitfall; ♂, QM S42287, Mt Spurgeon, 16°28'S 145°12'E, 20 Nov. 1997–8 Feb. 1998, Monteith & Cook, 1120 m O/F trap 7, pitfall; ♂, QM S42290, Black Mountain, 17 km ESE of Julatten, 16°39'S 145°29'E, 29–30 Apr. 1982, Monteith, Yeates & Cook, 800–1000 m; ♂, QM S42296, Mt Spec, 18°55'S 146°10'E, 6 Feb.–9 Mar. 1995, M. Cermak, 880 m, S2, malaise trap; ♂, QM S42297, Seaview Range, Mt Fox Rd, c. 18°51'S 145°50'E, 15 Dec. 1986, Monteith, Thompson & Hamlet, RF, 600 m; ♂♂, QM S42298, Paluma Dam Rd, site 3, 8 Dec. 1990–5 Feb. 1991, Monteith & Seymour, 800 m, flight intercept trap; ♂♂, QM S42299, Paluma Dam Rd, site 1, 8 Dec. 1990–5 Feb. 1991, Monteith & Seymour, 900 m, flight intercept trap; ♂♂, QM S42300, Paluma Dam Rd, site 5, 8 Dec. 1990–5 Feb. 1991, Monteith & Seymour, flight intercept trap; ♂♂, QM S46801, Mt Halifax summit, 19°07'S 145°23'E, 21 Mar.–10 May 1991, D. Cook, pitfalls & intercepts.

Diagnosis. CL 2.94–4.69. Separated from all species, except other northern Queensland species, by weakness of leg banding; from *T. monteithi* by larger size of scape and

smaller RTA; from *T. angusta* by greater width of scape and relatively wider cymbial flange; from *T. nasuta* by presence of scape.

Male (holotype). BL 6.78, CL 3.59 (2.94–4.69), CW 2.45, CapW 1.51, EGW 0.94, LL 0.55, LW 0.53, SL 1.84, SW 1.47. Legs: 1243 (I 17.42, II 15.83, III 12.67, IV 15.50); ratio tibia I length:CW = 1:0.55. Male palp: Fig. 13a,b. Cymbium wide with strongly developed retrolateral flange. Bulb wider than long; tegular lobe placed retrolaterally, with prominent conical base. Embolus origin retrolateral. Stem of T-shaped conductor prolaterally directed, posterior limb placed prolaterally; tegular window large, placed basally. RTA dorsad, hidden in ventral view; RVTA broad, width about half tibia length, with beak-like apex turned toward upper side in ventral view.

Female (S45528). BL 7.35, CL 3.47 (3.27–4.29), CW 2.20, CapW 1.67 EGW 0.98, LL 0.55, LW 0.55, SL 1.63, SW 1.31. Northern colour pattern. Legs: 1423 (I 12.25, II 10.50, III 8.67, IV 10.67); ratio tibia I length:CW = 1:0.71. Epigynum: Fig. 13c,d. Scape wide, sides gently concave, most of scape placed behind level of epigastric groove; in side view distoventral scape curved inwards, not protuberant; epigynal fossae oriented diagonally. Internal genitalia: Fig. 13e.

Variation. Epigynal scapes vary in width, the widest being those from Mt Lewis and near Lake Barrine.

Distribution. Northeastern Queensland from the Townsville region northwards to the Daintree region.

Etymology. The specific name is in honour of Christine Lambkin, the illustrator of the type specimens.

Therlinya angusta n.sp.

Figs. 14a–e, 17

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♂, QM S42281, Mount Misery road, 15°53'S 145°13'E, 6 Dec. 1990–17 Jan. 1991, Qld Museum & ANZSES, 730 m, flight intercept site 1. PARATYPES: ♀, QM S42271, Mt Hartley, 15°46'S 145°20'E, 6 Nov. 1974, J. Covacevich, D. Joffe & V.E. Davies, under stone on creek bed in cell retreat with web; ♂, KS58195, 4 ♀♀, KS69646–49, Windsor Tableland, near Forestry Hut, 16°16'S 145°02'E, 23 Jul. 1995, J. Thompson, M. Moulds, M. Tio, F. Mackillop, J. Olive, platform webs on side of bank in rainforest; ♀♀, KS44197, Windsor Tableland, at highest point of tableland, 16°14'S 145°00'E, 23 Jul. 1995, J. Thompson, M. Moulds, M. Tio, F. Mackillop, J. Olive, rainforest; ♀, KS43619, locality data as above, J. Thompson, 17 Apr. 1994; ♀, QM S42269, Thornton Peak via Daintree, 16°10'S 145°23'E, 22 Sep. 1981, G. Monteith & D. Cook, 700–1000 m, rainforest; ♂, QM S42282, Mt Sampson, 15°48'S 145°12'E, 27 Dec. 1990–18 Jan. 1991, ANZSES Expedition, 600–790 m, flight intercept trap; ♀, QM S42270, Shipton's Flat, 15°48'S 145°16'E, 19 Nov. 1975, V.E. Davies, C. Roberts, small shawl web & deep funnel retreat of thick silk in bank of dry stream bed.

Diagnosis. CL 2.98–4.78. Separated from all species, except other northern Queensland species, by weakness of leg banding; from *T. monteithi* by greater length of scape and smaller RTA; from *T. lambkinae* by lesser width of scape and relatively narrower cymbial flange width; from *T. nasuta* by presence of scape.

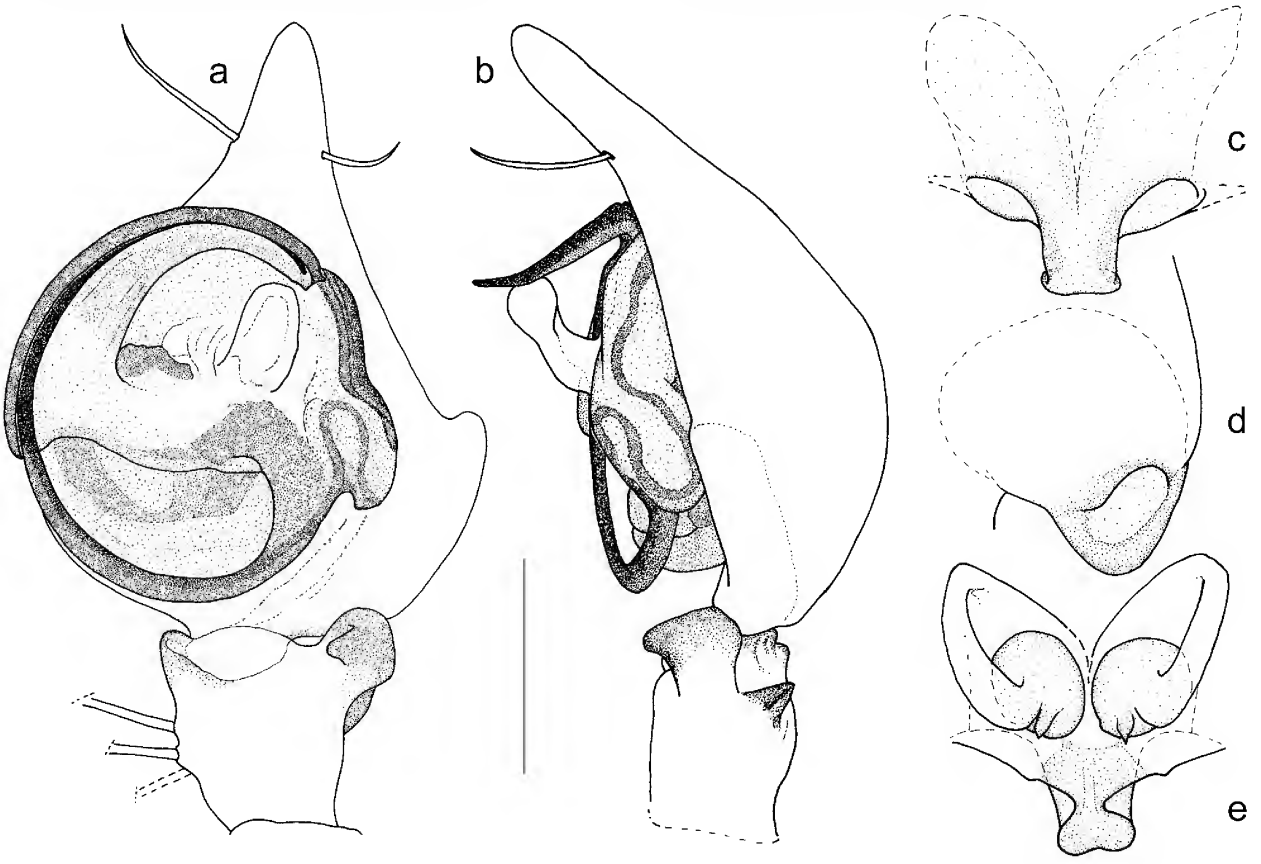

Figure 14. *Therlinya angusta*. a,b, male palp (KS58195): a, ventral; b, retrolateral; c–e, epigynum (S42271): c, ventral; d, lateral; e, dorsal—internal genitalia. Scale line 0.5 mm.

Male (holotype). BL 6.57, CL 3.22 (2.98–3.67), CW 2.37, CapW 1.43, EGW 0.92, LL 0.49, LW 0.49, SL 1.59, SW 1.39. Legs: 1423 (I 16.33, II 14.67, III 11.67, IV 14.83); ratio tibia I length:CW = 1:0.57. Male palp: Fig. 14a,b, KS58195. Cymbium wide with strongly developed retrolateral flange. Bulb subcircular; tegular lobe well developed, placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor prolaterally directed, posterior limb placed prolaterally; tegular window large, placed basally. RTA short, dorsad, mostly hidden in ventral view; RVTA broad, width about one-third tibial length, with beak-like apex turned toward upper side in ventral view.

Female (S42271). BL 7.84, CL 3.84 (3.35–4.78), CW 2.24, CapW 1.80, EGW 1.10, LL 0.59, LW 0.57, SL 1.71, SW 1.43. Northern colour pattern. Legs: 1423 (I 12.92, II 11.33, III 9.25, IV 11.50); ratio tibia I length:CW = 1:0.65. Epigynum: Fig. 14c,d. Scape relatively narrow, sides subparallel, distally truncate, at least half of scape projecting behind level of epigastric groove; in side view distoventral scape curved inwards, not protuberant; epigynal fossae oriented diagonally. Internal genitalia: Fig. 14e.

Distribution. From the Windsor Tableland northwards to Helenvale, south of Cooktown, northeastern Queensland.

Etymology. The specific name means "narrow" (L.) and refers to the width of the female scape in comparison to the other north Queensland species.

Therlinya monteithi n.sp.

Figs. 15a–f, 17

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♂, QM S45530, Massey Range, 4 km W of Centre Bellenden Ker, QLD, 17°16'S 145°49'E, 9–11 Oct. 1991, Monteith, Janetzki & Cook, 1250 m. PARATYPES: ♀, QM S45531, data as for holotype; ♂, KS34800, Yungaburra, 17°16'S 145°35'E, 19 Sep. 1976, R. Mascord; ♀, QM S42272, data as for holotype (retained by AMS: KS69650).

Other material. AUSTRALIA: QUEENSLAND—♂ QM S42291, Lambs Head, 10 km W Edmonton, 17°01'S 145°38'E, 4–13 Dec. 1988, Monteith & Thompson, 1200 m, flight intercept trap; ♂, QM S42295, Bartle Frere, W Base, 17°23'S 145°46'E, 25 Nov. 1994–10 Jan. 1995, Monteith & Hasenpusch, 50 m, flight intercept trap; ♂, QM S42279, Malanda Falls, Malanda, 17°21'S 145°36'E, 6 Oct. 1980, G.B. Monteith, 750 m, rainforest, stick brushing; ♂, QM S42293, Bellenden Ker Range, Cable Tower 3, 17°16'S 145°53'E, 17–24 Oct. 1981, Earthwatch/Qld Museum, 1054 m, flight intercept trap; ♀, QM S42277, Major's Mountain, 17°38'S 145°32'E, 14–20 Apr. 1978, V.E. Davies, & R. Raven (see under "variation", below); ♀♀, QM S42278, Maalan SF (as Malaan SF on label), 17°37'S 145°37'E, 20–24 Apr. 1978, V.E. Davies, R. Raven, large sheet web on bank with retreat funnel into roots; ♀, KS58378, Mt Hypipamee NP, The Crater, 17°25'29"S 145°29'00"E, 25 Apr.–2 May 1998, G. Milledge, rainforest, pitfall trap.

Diagnosis. CL 3.71–4.49. Separated from all species, except other northern Queensland species, by weakness of leg banding; from both *T. lambkinae* and *T. angusta* by the presence of a much shorter scape and a much larger RTA; from *T. nasuta* by presence of scape.

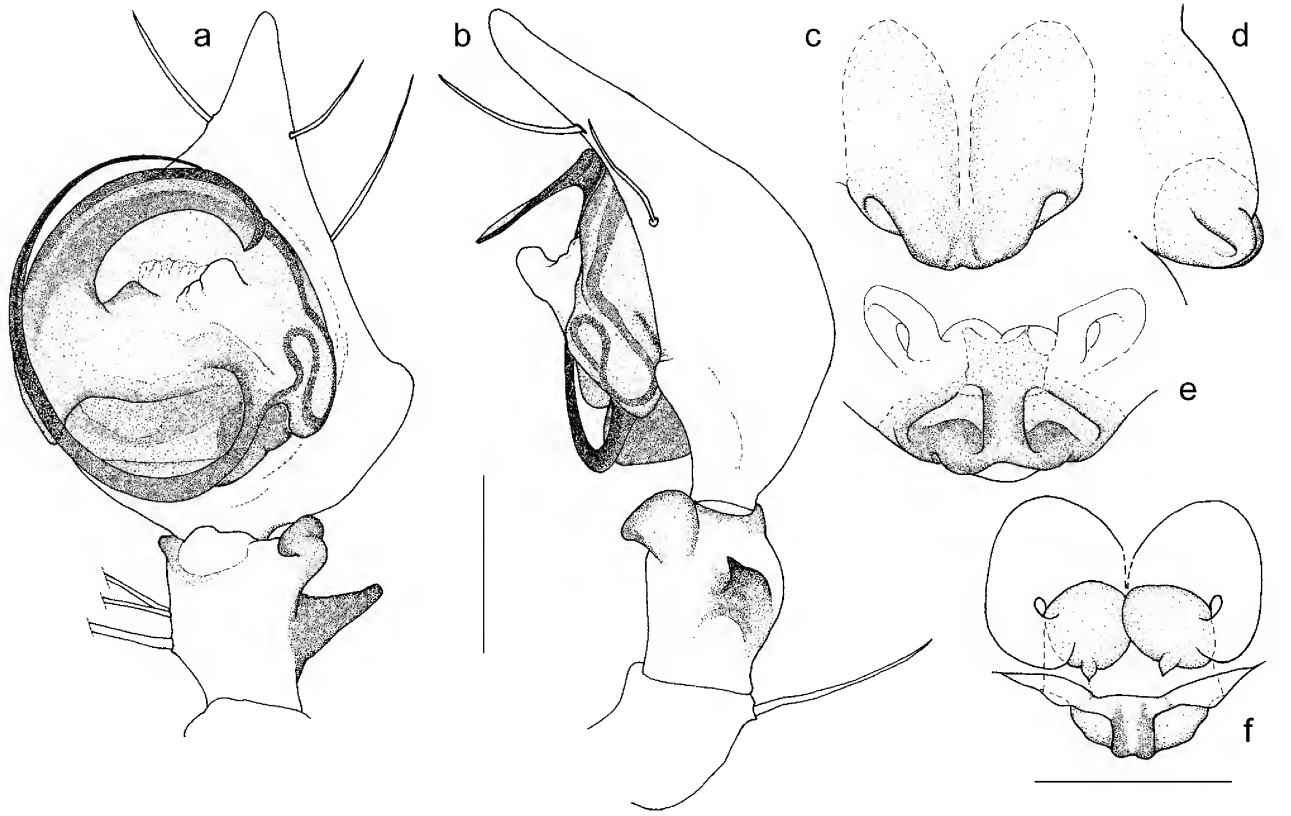

Figure 15. *Therlinya monteithi*. a,b, male palp (holotype): a, ventral; b, retrolateral (embolus free of conductor). c–f, epigynum (S45531): c, ventral; d, lateral; e, posterior; f, dorsal—internal genitalia. Scale lines 0.5 mm: vertical, a,b; horizontal, c–f.

Male (holotype). BL 8.90, CL 4.49 (3.71–4.49), CW 3.02, CapW 1.84, EGW 1.25, LL 0.69, LW 0.69, SL 2.12, SW 1.84. Legs: 2143 (I 21.00, II 21.17, III 15.67, IV 19.17); ratio tibia I length:CW = 1:0.56. Male palp: Fig. 15a,b. Cymbium wide with strongly developed retrolateral flange. Bulb wider than long; tegular lobe well developed, placed retrolaterally. Embolus origin retrolateral. Stem of T-shaped conductor prolaterally directed, posterior limb placed prolaterally; tegular window large, placed basally. RTA large, weakly dorsad, visible in ventral view; RVTA moderately broad, with blunt, beak-like apex turned toward upper side in ventral view.

Female (S45531). BL 7.76, CL 4.08 (3.88–4.49), CW 2.61, CapW 1.92, EGW 1.10, LL 0.63, LW 0.63, SL 1.87, SW 1.55. Northern colour pattern. Legs: 1423 (I 14.08, II 12.08, III 10.00, IV 12.42); ratio tibia I length:CW = 1:0.75. Epigynum: Fig. 15c–e. Scape wide, sides gently concave, most of scape placed behind level of epigastric groove; in side view distoventral scape curved inwards, not protuberant; epigynal fossae oriented diagonally. Internal genitalia: Fig. 15f.

Variation. Despite the fairly restricted distribution of this species, considerable variation was observed. Several specimens have been left unplaced until more comparative material is available. Male leg lengths vary from 1423, 1243 (legs 2 and 4 usually subequal) or less commonly 2143 (with 2 and 1 subequal). Females (S42274 and S42275) from west of Bones Knob near Atherton have epigynal scapes shapes that are intermediate with *T. angusta*; females (KS58379 and KS58380) from Danbulla SF show epigyna intermediate with *T. lambkinae*. A male specimen (S42292) from Massey Creek, E of Ravenshoe, differs from other males in the conductor shape, position of RTA and larger size. However, females (S42277 and S42278), from the same area, closely resemble the current species and are listed above.

Distribution. Ravenshoe area northwards to Cairns, northeastern Queensland.

Etymology. The specific name is in honour of Geoff Monteith, research entomologist and a collector of the type specimens.

Therlinya nasuta n.sp.

Figs. 16a–c, 17

Type material. AUSTRALIA: QUEENSLAND—HOLOTYPE: ♀ QM S42263, 7 km N of Mt Spurgeon (Camp 2), 16°22'S 145°13'E, 17–19 Oct. 1991, 1200–1250 m, Monteith, Janetzki, Cook & Roberts. PARATYPES: ♀ QM S42266, Black Mountain, 4.5 km N of Mt Spurgeon, 16°24'S 145°12'E, 17–18 Oct. 1991, 1250–1330 m, Monteith, Janetzki, Cook & Roberts; ♀ QM S42264, Carbine Tableland, Roots-Francis Ck divide, 16°25'S 145°15'E, 28 Nov. 1990, 1250 m, Monteith, Thompson, Cook, Sheridan & Janetzki (retained by AMS: KS76967).

Diagnosis. CL (3.33–3.58). Differs from all other species by its reduced scape with a prominent ventrally curved tip.

Male. Unknown.

Female (holotype). BL 7.25, CL 3.58 (3.33–3.58), CW 2.12, CapW 1.76, EGW 1.02, LL 0.55, LW 0.55, SL 1.59, SW 1.35. Northern colour pattern. Legs: 1243 (I 11.50, II 10.08, III 8.17, IV 10.00); ratio tibia I length:CW = 1:0.75. Epigynum: Fig. 16a,b. Scape reduced and narrow, ventral surface concave, ending in a ventrally directed knob-like prominence. Internal genitalia: S42264, Fig. 16c.

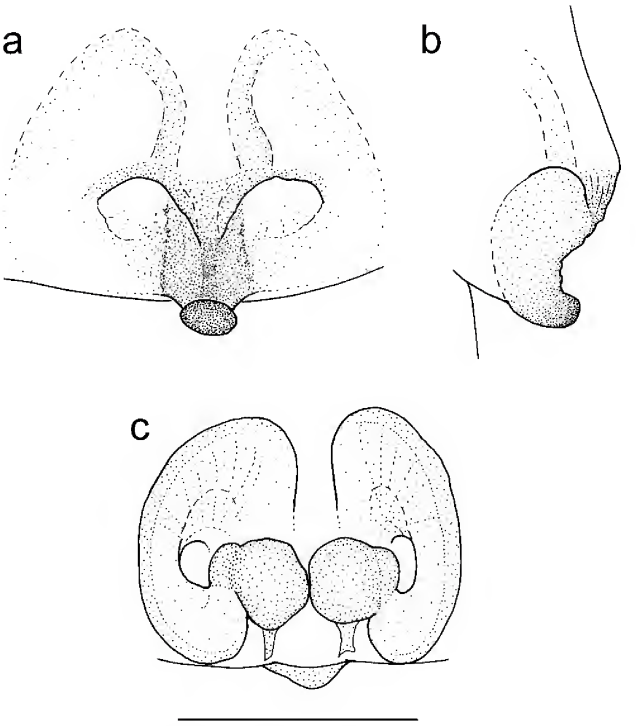

Figure 16. *Therlinya nasuta*. a–c, epigynum (holotype): a, ventral, b, lateral; c, dorsal—internal genitalia (S42264). Scale line 0.5 mm.

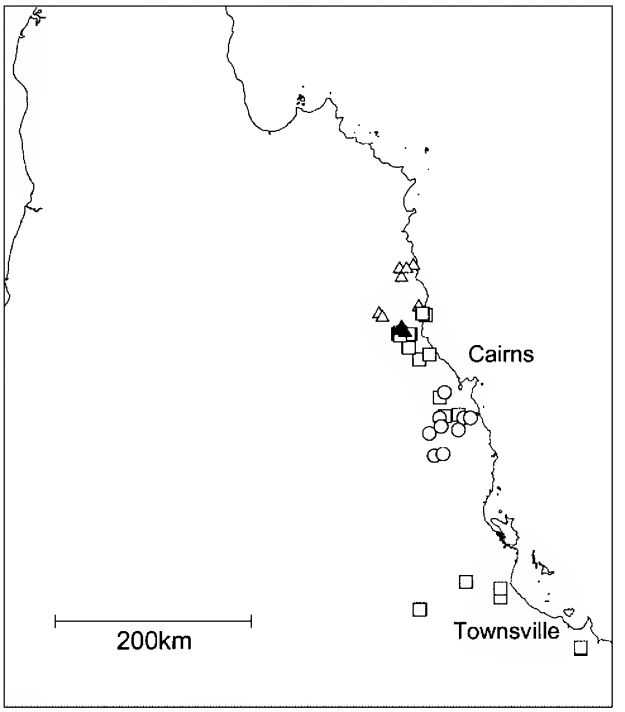

Figure 17. Distribution of *Therlinya* species: north Queensland. ○ *T. monteithi*, □ *T. lambkinae*, △ *T. angusta*, ▲ *T. nasuta*.

Distribution. Known only from the Mt Spurgeon region, west of Mossman, northeast Queensland.

Etymology. Named for the rather nose-like lateral appearance of the epigynal scape (L.).

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Bandella, A New Hilarine Fly Genus from Australia (Diptera: Empididae)

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ABSTRACT. *Bandella* n.gen. (Diptera: Empididae: Empidinae: Hilarini) is described from mainland Australia and Tasmania, and comprises nine new species: *B. albitarsis, B. cerra, B. allynensis, B. costalis, B. duvalli, B. maxi, B. montana, B. noorinbee*, and *B. tasmanica*. *Bandella* is distinguished from other genera in the Hilarini by the following combination of characters: mesonotum glabrous, without pruinosity, but with diagnostic colour patterns; mesonotal vestiture highly reduced, comprising only short setulae; male tarsus I unmodified; and male abdominal terga 7 and 8 reduced or modified to form flaps so that hypopygium can be flexed forward. The genus is distinctive in having an almost fully formed vein CuP running lengthwise across the centre of cell cup. Although vein CuP is part of the wing groundplan in Diptera, it has variable expression in the lower Brachycera. In other Empididae, this vein is either residual and positioned closely posteriad of vein CuA_2, or totally absent. Also, *Bandella* has a divided and sclerotised male cercus, a character also shared by the endemic Tasmanian hilarine genus *Cunomyia* Bickel. *Bandella* has a predominately temperate Bassian distribution: Tasmania, southeastern and southwestern Australia, with an outlying species in submontane rainforest of tropical Queensland.

BICKEL, DANIEL J., 2002. *Bandella*, a new hilarine fly genus from Australia (Diptera: Empididae). *Records of the Australian Museum* 54(3): 313–324.

This is the third contribution to a revision of the Australian Hilarini (Diptera: Empididae: Empidinae) (see Bickel, 1996, 1998). This tribe is taxonomically rich in Australia, with hundreds of species awaiting description, especially in the complex of genera similar to the cosmopolitan genus *Hilara*.

This short paper describes *Bandella*, a distinctive new genus comprising nine new species: eight are from temperate Australia and one is from submontane rainforest in the Queensland wet tropics. It is distinguished by a strongly developed vein CuP, a thorax almost totally devoid of major setae but with shining patterned cuticle, an unswollen (i.e., unmodified) male basitarsis I, and by a tendency to curl the distal tarsomeres on all legs (dried specimens). *Bandella* is morphologically isolated with respect to other genera in the Hilarini, although it possibly is closest to the Tasmanian hilarine genus *Cunomyia* Bickel, as both genera share a divided male cercus.

Materials and methods

This study is based on material housed in major Australian and overseas collections (see Acknowledgements for list of repositories and their abbreviations). Morphological terminology follows McAlpine (1981) except that of the male terminalia, which follows Cumming *et al.* (1995). Measurements are in millimetres and based on representative dry specimens. The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres are representative ratios and not measurements, and are presented in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5.

The following abbreviations and terms are used (museums and other collections are listed in Acknowledgments): FSSC, female secondary sexual character(s), the

non-genitalic characters found only on female body; MSSC, male secondary sexual character(s), the non-genitalic characters found only on male body; I, II, III: pro-, meso-, metathoracic legs; C, coxa; T, tibia; F, femur; ac, acrostichal setae; ad, anterodorsal; av, anteroventral; dc, dorsocentral setae; dv, dorsoventral; pd, posterodorsal; pv, posteroventral; t, tarsus; t_{1-5}, tarsomeres 1 to 5. Geographical abbreviations: FR, Flora Reserve; NP, National Park; NR, Nature Reserve; SF, State Forest.

Genus *Bandella* n.gen.

Type species. *Bandella allynensis* n.sp.

Diagnosis. Flies in the tribe Hilarini; mesonotum glabrous, without pruinosity, but with species diagnostic colour patterns present; mesonotum with ac and dc reduced to setulae, and posterior slope covered with field of scattered setulae; tibia I without distinct anteroapical comb; male basitarsus not swollen; costa circumambient, although reduced in thickness along posterior margin; Sc incomplete; R_{4+5} branched, with R_4 diverging at 45° angle and slightly sinuate, and R_5 ending behind wing apex; CuA_2, strongly recurrent; vein CuP present as distinct vein across cell cup; abdomen terga without strong marginal setae; tergum 7 often with U-shaped median excavation; tergum 8 usually with lateral flaplike projections; hypopygium can flex anteriad at rest; male cercus divided into short basal plate and digitiform clasping cercus.

Description. Rather large, body length 7.0–11.5.

Head spheroidal, with convex post-cranium; post-cranium sometimes with distinctive pruinosity, vertex and frons usually shining with little pruinosity; major setae absent; postcranium with scattered pale ventral hairs, postorbitals short; postvertical setae very short, black; ocellar triangle not distinctly raised; ocellar setae reduced to short hairs; frons slightly narrower than ocellar triangle, and with very short hairs along lateral margins; eyes notched laterad of antennae; face as wide as frons and slightly expanded apically, often covered with pruinosity; palp yellow with white setae, curved and slightly clavate; labrum tapering and heavily sclerotised, about one and a half head height in length, and projecting ventrally; labellum separated from and subequal with labrum; antenna (Fig. 3c) scape about twice as long as pedicel; first flagellomere tapering, longer than scape and pedicel combined, and with short 2–articled apical style.

Thorax. Mesonotum glabrous, without pruinosity, but pleura with pruinosity; mesonotum with species diagnostic colour patterns present, usually similar in both sexes, but sometimes sexually dimorphic; mesonotum with only short setulae and apart from following major setae: 2 posterior notopleural (npl) setae, 1 short postalar (pa) seta, and 1 short posterior intra-alar seta: ac band 3–4 setulae wide, with bare cuticle each side of this band; remainder of mesonotum, including posterior slope covered with field of scattered short setulae; prothoracic collar (pronotum) with some short setae; proepisternum with field of 8–10 pale hairs; scutellum rather weakly developed and with pair of median marginal setae and some adjacent short lateral setae; laterotergite bare; postnotum broad and bulging.

Legs. All tarsi with strong black claws and large yellowish pulvilli; tarsi often curled in repose in dried specimens; FI and TI mostly with short vestiture; TI without distinct anteroapical comb, although some species have irregular setal row of variable length; male It_1 not swollen; TI and each tarsomere It_{1-3} with 2–3 pairs of subapical av-pv setae, and It_{1-3} with dense ventral vestiture; TII with pair strong av-pv setae; each tarsomere IIt_{1-3} with apical setae; IIt_{2-5} each slightly flattened with pale ventral pile; FIII weakly expanded in distal third; TIII without strong setae.

Wing (Fig. 3b); membrane hyaline; costa circumambient, although reduced in thickness along posterior margin; Sc distinctly incomplete; R_1 slightly swollen near join with costa, and brownish stigma present under distal R_1; costa haired, but other veins bare; R_{4+5} branched, with R_4 diverging at 45° and slightly sinuate, and R_5 ending behind wing apex; M_1, M_2, and CuA_1 all joining margin; CuA_2, which closes cell cup, strongly recurrent; vein CuP present as almost fully formed vein across cell cup; A_1 present distally only as fold, and arising midway along cell cup; A_2 present as trace; anal angle weak to absent; lower calypter yellowish with yellow setae; halter yellow.

Abdomen. Cuticle glabrous, with little pruinosity; tergum 1 with some pale setae laterally, otherwise abdomen with only short yellowish vestiture, without strong marginal setae; tergum 1 relatively short with membranous median window; abdominal plaques present on terga 2–5; tergum 7 often with U-shaped median excavation; tergum 8 usually with lateral flaplike projections (e.g., 4b,c); hypopygium can flex anteriad at rest; male cercus distinct and divided into sclerotised short basal cercal plate and digitiform clasping cercus; hypandrium keel-like; aedeagus elongate and conforming to curvature of hypandrium, epandrium broad, with distal curved projection; distinct surstylus not evident.

Female oviscapt relatively unmodified, with subequal terga and sterna on segments 9 and 10, and with pair elongate apical cerci (Fig. 3f).

Etymology. *Bandella* means "little Banda", a diminutive derived from Mt Banda Banda, a New South Wales locality where the genus occurs. The gender is feminine.

Remarks

Bandella comprises nine species from mainland Australia and Tasmania. Species occur mostly in wet sclerophyll eucalypt forests and rainforests, and mostly at higher altitudes. Although the genus has an essentially temperate Australian or Bassian distribution of southeastern and southwestern Australia and Tasmania, one species occurs above 1000 m in submontane rainforest in tropical Queensland.

Bandella is best placed in the Hilarini, as discussed in the next section. It is confined to Australia, and is not close to any described genus from temperate Gondwanan regions: New Zealand (Collin, 1928), Patagonia (Collin, 1933) and southern Africa (Smith, 1969). However, based on a shared character, the divided sclerotised male cercus, *Bandella* possibly has a distant relationship with the endemic Tasmanian genus *Cunomyia* Bickel.

Bandella has a glabrous thorax with strong colour patterns, and almost all major dorsal thoracic setae are reduced to setulae. By contrast, most other hilarines have a pruinose thoracic surface, and at least some strong thoracic setae, especially the anterior dc. Variation is evident in the thoracic pattern of some *Bandella* species, which may reflect age, nature of preservation or intraspecific variation. For example, the strong contrast between yellow and dark brown on some specimens may be obscured by a general infuscation of the entire specimen, possibly a direct function of age (e.g., Figs. 2h,i). Although the thoracic patterns are usually the same in both sexes, they are sometimes strikingly dimorphic, as in *B. noorinbee* (Fig. 2d,e). However, the basic contrasting thoracic pattern as suggested by the figures remains diagnostic for each species and is useful in identifying females.

The male postabdomen is variously modified to receive the deflexed hypopygium. In all species except *B. maxi* tergum 7 is medially excavated, and in some species tergum 8 has lateral flap-like projections (Fig. 4b,c). In dried specimens of *Bandella*, particularly *B. costalis, B. duvalli, B. montana*, and *B. tasmanica*, the tarsi are distinctly curled in repose, as in Fig. 1.

There is good evidence of adult nectar feeding in the genus. *Bandella duvalli* was collected off the nectar-rich blossoms of *Leptospermum* (Myrtaceae) bushes in Tasmania, and *Leptospermum* pollen was found on the

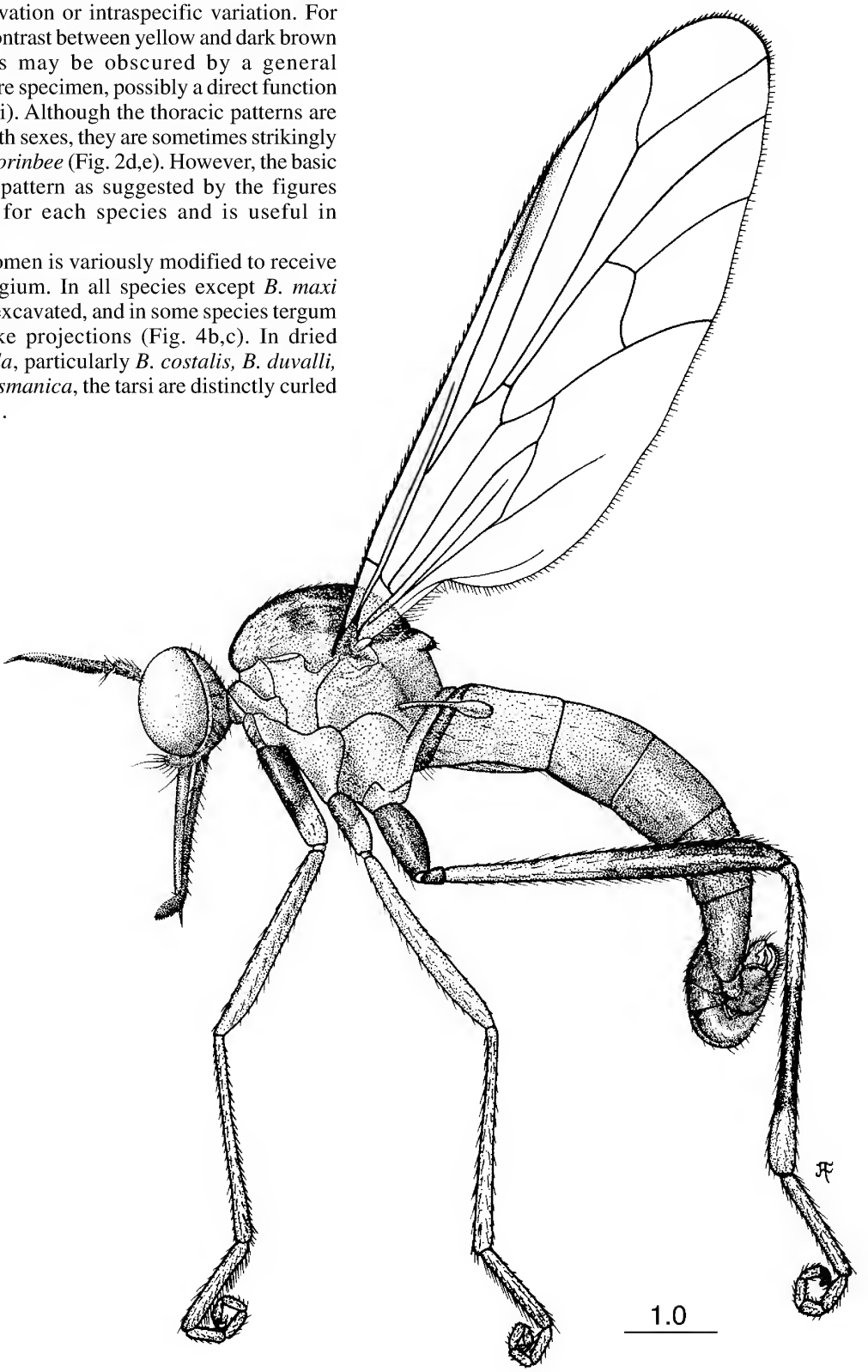

Figure 1. *Bandella duvalli*, ♂, habitus. Mt Pelion, Tasmania.

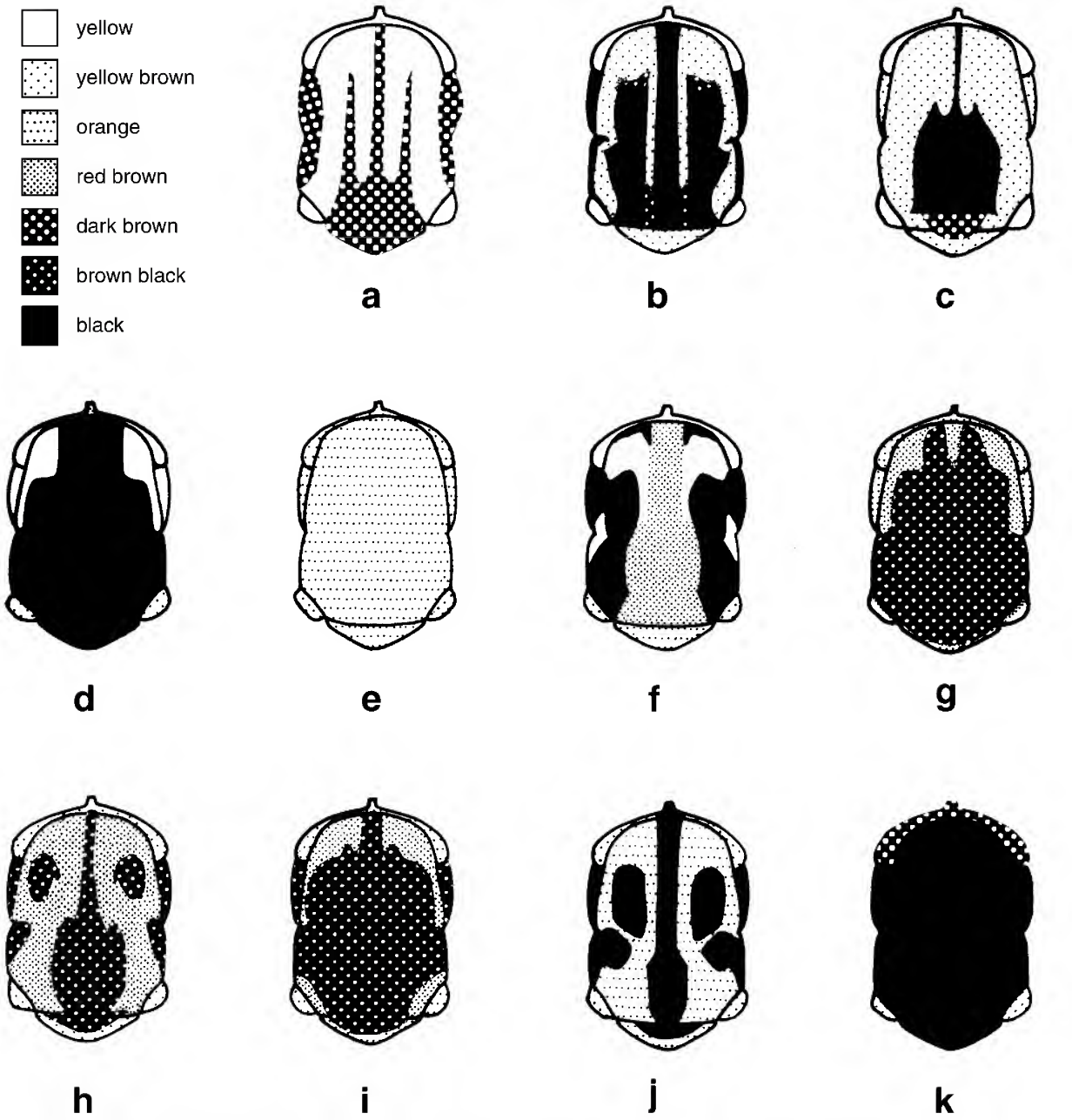

Figure 2. Dorsal thoracic colour pattern, *Bandella* spp. a, *B. allynensis* ♂; b, *B. cerra* ♂; c, *B. montana* ♂; d, *B. noorinbee* ♂; e, *B. noorinbee* ♀; f, *B. albitarsis* ♂; g, *B. maxi* ♂; h, *B. duvalli* ♂ (holotype); i, *B. duvalli* ♂ (variant); j, *B. tasmanica* ♂; k, *B. costalis* ♂.

proboscis of *B. albitarsis* in New South Wales. Nectar feeding is well known among the Empidinae (e.g., Chvála, 1976). Specimens of *B. allynensis* have also been taken on sticky traps placed on smooth barked *Eucalyptus* trunks, which indicates adults occasionally rest on tree trunks.

Mating behaviour is unknown. Males do not have swollen fore basitarsi producing silk for wrapping nuptial gifts characteristic of the complex of genera near *Hilara*. Of particular interest are the bright silvery pruinose patches present on the head, thorax and legs of both sexes of *Bandella albitarsis*. These silvery patches may facilitate sexual recognition in flight, especially since incident light would make them appear to "flash" while turning.

Morphological notes and systematic position of *Bandella*

I presented (Bickel, 1996) a set of characters useful in separating the two major tribes of the Empidinae, the Empidini and the Hilarini. Since many characters are variable in expression and must be qualified, higher level taxa have to be defined as a mosaic of characters, a "polythetic classification," no character necessarily being diagnostic for all members (Gauld & Mound, 1982). As so defined, *Bandella* has the following set of characters that place it in the Hilarini: laterotergite bare; hypandrium forming a curved convex hood over aedeagus; costa circumambient; vein R_1 distinctly swollen before it joins the costa. *Bandella* does not have the following hilarine characters: tibia I with anteroapical comb of 8–10 short even setae; male cercus small

and desclerotised, and fused laterally with the surstylus and epandrium; male basitarsus I enlarged or swollen.

With the large number of undescribed taxa in the Hilarini, both in Australia and throughout the world, it is premature to attempt any phylogenetic analysis of the tribe. However, two important morphological characters should be discussed—vein CuP and the male cercus.

Vein CuP. *Bandella* is distinctive in having an almost fully formed vein CuP running lengthwise across the centre of cell cup (Fig. 3b), and not posteriorly close to vein CuA_2 or vestigial as found in some other empidids (e.g., *Brachystoma* and some *Empis*, figures in Chvála, 1983). However vein CuP is absent in *Hilara*, most *Empis* spp. and the Trichopezinae. By contrast in *Bandella*, CuP is strongly developed in all species, although it looks almost like a *vena spuria*, and not carrying haemolymph. Vein CuP is plesiomorphic to the Diptera as a whole and part ground plan for the Diptera wing (McAlpine, 1981), but its expression is variable in the lower Brachycera. For example, it is variously developed in the Asiloidea, but usually weak and just behind vein CuA_2.

Cercus. Most male Hilarini have a cercus which is rather small, desclerotised, and fused laterally with the surstylus and epandrium (Cumming & Sinclair, unpubl. data). *Bandella*, by contrast, has an enlarged sclerotised male cercus, which is divided into a distinctive digitiform "clasping cercus" and smaller "cercal plate" (see Fig. 4b). This cercal form is similar to that of the monotypic Tasmanian genus *Cunomyia* Bickel (see Sinclair, 1995 and Bickel, 1998 for further discussion), and this shared character indicates a possible close phylogenetic relationship between these two Australian genera.

Key to species of *Bandella* (males)

1 Abdomen almost entirely shining black with violet reflections, with at most some lateral yellow colour on tergum 1 2

—— Abdomen with some red, brown or yellow terga 3

2 Large, length >10.0; thoracic pattern, mesonotum mostly orange, but black over posterior slope, scutellum mostly orange, Fig. 2c; legs mostly yellow; hypopygium (Fig. 3d) mostly yellow (NSW, Vic.) ..... *B. montana* n.sp.

—— Small, length <7.5; male mesonotum and scutellum black, Fig. 2d (female thorax completely orange, Fig. 2e); scutellum black; coxae yellow; remainder of legs dark brown to black; hypopygium (Fig. 3e) black (Vic., NSW) ..... *B. noorinbee* n.sp.

3 Post-cranium with silvery pruinose band around outer rim; thoracic pattern, Fig. 2f; pleuron with bright silvery pruinose areas; It_{2-5} white; $IIIt_{2-5}$ pale yellow; abdomen, including hypopygium mostly yellow (NSW) ..... *B. albitarsis* n.sp.

—— Head and thorax without silvery pruinosity; tarsus I yellow to black, but not white 4

4 TII and tarsus II with long anterior and posterior setae, Fig. 5e; mesonotum and scutellum almost entirely black, Fig. 2k; FIII slightly clavate in distal half; abdominal terga yellow with black posterior border (WA) ..... *B. costalis* n.sp.

—— Legs without long setae, only with normal short vestiture; mesonotum with some red, yellow or brown colouration; FIII and abdomen variously developed 5

5 TIII banded, with yellow apex and base, and dark brown median band (as in Fig. 1) (Tas.) 6

—— TIII either entirely yellow or yellow with dark brown apex (Aust. mainland) 7

6 Coxae dark brown/black; anterior mesonotum mostly red-brown; posterior mesonotum black with interdigitation of red anteriorly (Fig. 2h,i); FIII yellowish in basal half but distally dark brown; tarsus III dark brown; hypopygium (Fig. 4b,c) mostly black ..... *B. duvalli* n.sp.

—— Coxae mostly yellow; anterior mesonotum mostly orange; with black ac band and black spot laterad of dc row (Fig. 2j); FIII mostly red-yellow; tarsus III entirely yellow; hypopygium (Fig. 4a) mostly yellow except for dark brown apex ..... *B. tasmanica* n.sp.

7 Antenna entirely dark brown; anterior mesonotum red-brown, interdigitating with black posterior mesonotum (Fig. 2g); scutellum black with reddish margin; postnotum black; abdominal terga 1 and 2 reddish, hypopygium (Fig. 4d) with hypandrium greatly expanded and keel-like (n. Qld) ..... *B. maxi* n.sp.

—— Antennal scape and pedicel yellowish, first flagellomere black; pleura and postnotum dark brown with yellowish areas; anterior mesonotum mostly yellow; postpronotum and postalar callus pale yellow; scutellum yellow but infuscated basally; hypopygium not expanded, similar to Fig. 3a 8

8 Coxae II and III dark brown; thorax with posterior slope of mesonotum dark brown and with thin brown strip extending anteriorly over dc band (Fig. 2a); TIII mostly yellow; It_1 yellow; hypopygium (Fig. 3a) entirely dark brown (NSW) ..... *B. allynensis* n.sp.

—— Coxae II and III mostly yellow; mesonotum with three brown bands extending to scutellum and with lateral dark brown areas (Fig. 2f); TIII yellow but with distal fifth brown; It_1 distinctly brown, in contrast to yellow TI and tarsomeres It_{2-4}; hypopygium with dark brown hypandrium and surstyli, but distinctly yellow epandrium (NSW) ..... *B. cerra* n.sp.

Bandella allynensis n.sp.

Figs. 2a, 3a–c

Type material. HOLOTYPE ♂ and PARATYPES, 2♂, 10♀ all New South Wales, Upper Allyn River, 1500 ft (410 m), 9.xi.1960, I.F.B. Common & M.S. Upton (ANIC).

Additional material. New South Wales: 3♂, 2♀, New England NP, Point Lookout, 1400 m, *Nothofagus* forest, 22.i.1967 (UQIC); Wilson River Reserve, 31°12'S 152°28'E, 240 m, wet sclerophyll/ subtropical rainforest: ♀, 26.xi.1966, & ♂, sticky trap on *Eucalyptus grandis*, 16–19.xi.1998; ♂, ♀ Carrai SF, Daisy Plains, 30°54'19"S 152°17'36"E, 1055 m, 11–16.i.1998, wet sclerophyll forest, sticky trap on eucalyptus trunk (AMS).

Description (male): length: 9.4–9.8; wing: 8.2×1.4. *Head*: post-cranium black, covered laterally and ventrally with grey pruinosity; dorsal post-cranium, vertex and frons black without pruinosity; postcranium with usual pale ventral hairs; dorsal postcranium bare; postorbital setae white ventrally, black dorsally; labrum dark brown but yellow at middle; labellum dark brown; antennal scape and pedicel yellowish to brown; first flagellomere black.

Thorax: pleura and postnotum dark brown with yellowish areas, and covered with grey pruinosity; anterior mesonotum mostly yellow with pale yellow postpronotum and postalar callus; ac band dark brown, and dark brown stripe present from postpronotum to postalar callus; posterior slope of mesonotum dark brown, with thin brown strip extending anteriorly over dc band, but fading out near mesonotal suture (Fig. 2a); scutellum yellow but infuscated at base; posterior slope of mesonotum with some short setulae.

Legs: CI yellow and trochanter I yellow with dark brown apical rim; coxae and trochanters II and III distinctly dark brown; remainder of leg I yellow except distal tarsomeres infuscated; FII and FIII basally yellow; but infuscated distally; TII and TIII mostly yellow, but TIII infuscated apically; tarsi II and III brown; leg vestiture brownish; coxae with only short pale vestiture, no strong setae; all tarsi with strong black claws and large yellowish pulvilli; I: 11.0; 11.5; 6.0/ 3.5/ 1.5/ 1.2/ 1.3; FI and TI mostly with short vestiture; It_2 and It_3 each with two closely appressed subapical pv setae, which are distinctly longer than single corresponding single av seta.(MSSC); It_{2-5} ventrally flattened with pale vestiture; II: 11.0; 11.5; 6.0/ 3.5/ 1.5/ 1.2/ 1.3; TII with pair strong av-pv setae; each tarsomere IIt_{1-3} with apical setae; IIt_{2-5} each slightly flattened with pale ventral pile; III: 15.0; 17.0; 7.0/ 3.0/ 1.3/ 1.8/ 1.6; FIII weakly expanded in distal third; TIII without strong setae; IIIt with short black vestiture.

Abdomen: tergum 1 dark brown; tergum 2 with basal third yellow and distally dark brown; terga 3–6 mostly yellow but each tergum with dark brown posterior marginal band (in darker specimens, marginal band larger and with dorsoanterior extensions on most terga); cuticle glabrous, without pruinosity; tergum 7 with U-shaped median excavation; tergum 8 unmodified; hypopygium (Fig. 3a); male cercus divided into short basal cercal plate and digitiform clasping cercus.

Female similar to male except as noted: thorax with similar colour; leg vestiture somewhat weaker than on male; It_2 and It_3 each with single subequal subapical av-pv setal pair.

Remarks. *Bandella allynensis* occurs in subtropical and temperate rainforests and wet sclerophyll eucalypt forests along the ranges of northeastern New South Wales. Specimens taken in sticky traps (sheets of clear plastic coated with sticky substance and attached to tree trunks) suggest the species occasionally rests on tree trunks. There is some variation in the extent of the dark brown area on the mesonotum (Fig. 2a).

Bandella cerra n.sp.

Fig. 2b

Type material. HOLOTYPE, ♂ (K 173134), PARATYPES, ♂ (K 173135), ♀ (K 173136), New South Wales: Barrington Tops NP, Gloucester Tops, 32°04'S 151°34'E, 1280 m, *Nothofagus moorei* forest along creek, 4–30.xii.1988, malaise trap, D.J. Bickel (all AMS).

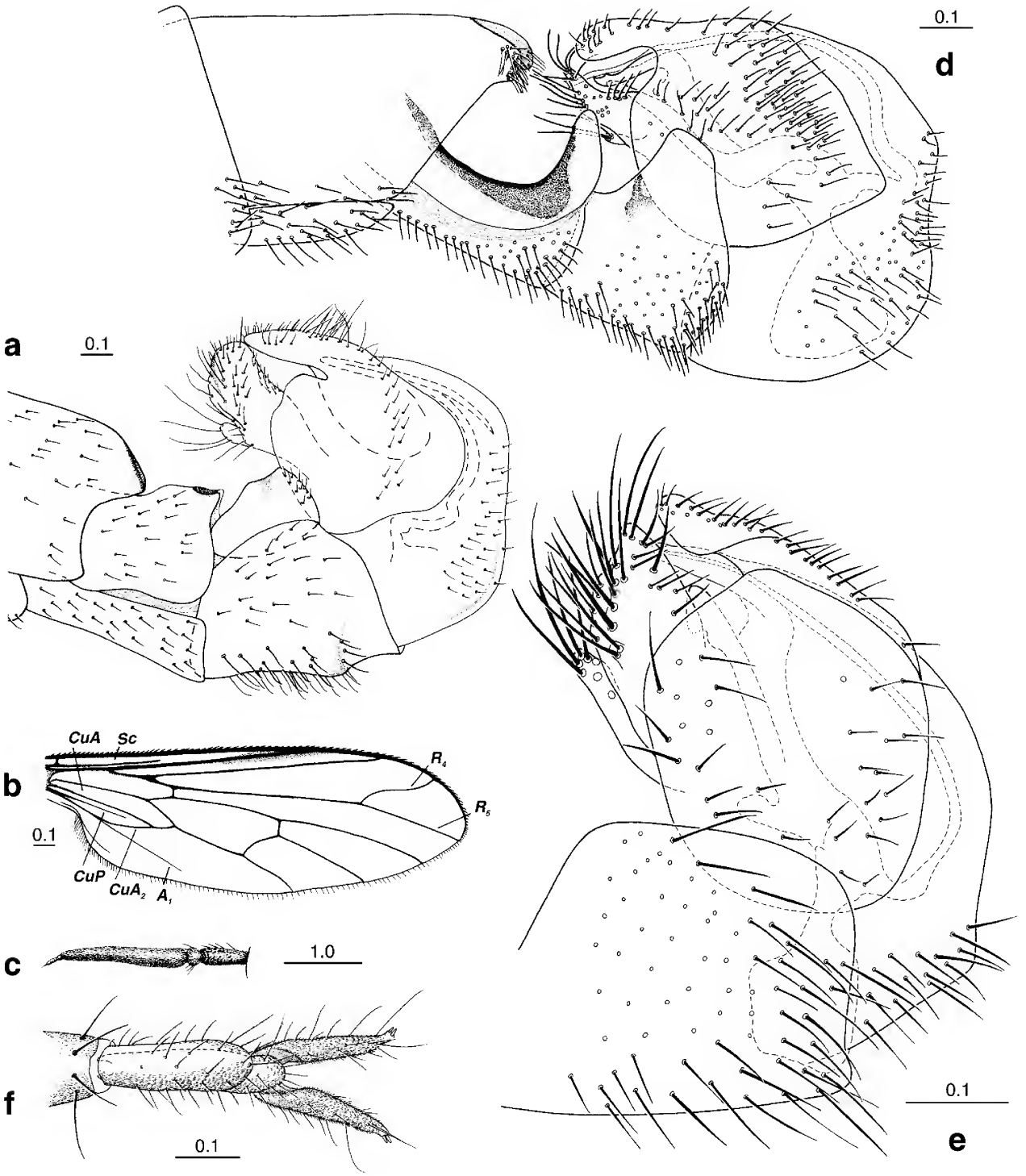

Figure 3. *Bandella allynensis*: a, male postabdomen; b, male wing, dorsal; c, male antenna, left lateral. *Bandella montana*: d, male postabdomen, left lateral. *Bandella noorinbee*: e, male postabdomen, left lateral; f, female oviscapt, dorsal.

Additional material. New South Wales: ♂, Barrington Tops, via Salisbury [no elevation], 28–30.xii.1965 (UQIC); ♂, Mt Banda Banda FR, 31°10'S 152°26'E, 1200 m, cool temperate rainforest, 14.i.1988 (AMS).

Description (male): length: 8.5–9.5; wing: 6.9×1.3; similar to *B. allynensis* except as noted. *Head*: scape black. *Thorax*: pleura and postnotum dark brown with yellowish areas, and covered with grey pruinosity; anterior mesonotum mostly yellow with pale yellow postpronotum and postalar callus; ac band dark brown and extending to scutellum, with yellow bands on either side, also extending to scutellum, and with brown areas laterad which extend from mesonotal suture back to scutellum (Fig. 2b); scutellum yellow but infuscated at base.

Legs: CI yellow; trochanter I yellow with dark brown apical rim; coxae and trochanters II and III yellowish with brown areas, and covered with grey pruinosity; FI and TI

yellow; It_1 distinctly brown, in contrast to yellow TI and distal tarsomeres; It_{2-5} yellow; It_2 and It_3 each with two closely appressed subapical pv setae, which are distinctly longer than single corresponding single av seta.(MSSC); It_{2-5} ventrally flattened with pale vestiture; FII and TII yellow; It_{1-2} brown, and It_{3-5} yellow; FIII yellow basally, grading to brown in distal third; TIII yellow with but distal quarter brown; IIIt dark brown.

Abdomen: tergum 1 dark brown; terga 2–6 mostly yellow but each tergum with dark brown apical ring and with dark brown dorsal band so that abdomen appears to have dorsal stripe; hypopygium (not figured, but similar to Fig. 3a) with dark brown hypandrium and surstyli, but distinctly yellow epandrium.

Female similar to male except as noted: thorax with similar colour; leg vestiture somewhat weaker than on male; It_2 and It_3 each with single subequal subapical av-pv setal pair; abdomen with similar pattern.

Remarks. *Bandella cerra* is known from *Nothofagus moorei* dominated cool temperate rainforest in the Barrington Tops and Mt Banda Banda, in northeastern New South Wales. These sites are in the Central Eastern Rainforest Reserves of Australia (CERRA) World Heritage Area, hence the specific epithet.

Bandella montana n.sp.

Figs. 2c, 3d

Type material. HOLOTYPE, ♂ (K 173137), PARATYPES, ♂ (K 173138), ♀ (K 173139), New South Wales: Barrington Tops NP, 5.xii.1976, G. Daniels (all AMS).

Additional material. NEW SOUTH WALES: NSW: Mt Wilson, Blue Mountains, 33°30'S 150°23'E, 950 m, ♀, 5.xii.1956, ♀, 1.xi.1975, ♂, 10.xi.1990 (AMS); ♂, New England NP, 5.xi.1981 (AMS); ♂,Mt Tomah, Blue Mtns, 33°33'S 150°25'E, x.1930 (MVM). VICTORIA: ♀, Thomson River, 6 km E of Mt Gregory, 24.xi.1976 (MVM).

Description (male): length: 11.0; wing: 8.8×2.7. *Head*: postcranium laterally and ventrally with dusting of grey pruinosity; dorsal postcranium, vertex and frons shining black with no pruinosity; ventral postcranium with scattered pale setae; postorbitals present as short white setae ventrally, black dorsally; face covered with silvery pruinosity; labrum and labellum entirely yellow; antenna black but pedicel brownish in some specimens.

Thorax: pleura and mesonotum mostly red-yellow, except posterior mesonotum with black area extending almost to scutellum, but varying in extent from large area (Fig. 2c) to a small black dot, almost absent; scutellum yellow but brownish basally; pleura with some pruinosity, but mesonotum glabrous; scutellum with pair brownish median marginal setae, with some adjacent short setae.

Legs: coxae and remainder of legs yellow; coxae with only short pale vestiture, no strong setae; femora and tibiae with mostly short black vestiture; all tarsi with strong black claws and large yellowish pulvilli; I: 11.5; 11.5; 5.0/ 2.0/ 1.6/ 1.4/ 1.5; TI and each tarsomere It_{1-3} with 2–3 pairs of subapical av-pv setae, and It_{1-3} with dense ventral vestiture; II: 12.5; 12.0; 5.0/ 2.0/ 1.2/ 1.1/ 1.5; each tarsomere IIt_{1-4} with dense ventral vestiture, and with some subapical av-pv setae; III: 18.0; 17.0; 6.3/ 2.1/ 1.8/ 1.5/ 1.8; FIII very slightly clavate in distal third; tarsomeres $IIIt_{1-2}$ ventrally swollen with dense vestiture.

Abdomen: segments 1–6 shining black with some violet reflections, although tergum 2 yellow in basolaterally; segments 7 and 8 yellowish; tergum 6 dorsally with median-posterior U-shaped excavation, and tergum 7 with lateral flaplike projections; hypopygium yellowish (Fig. 3d).

Female similar to male except as noted: post-cranium also with grey pruinosity; thorax with similar colour and black patch size variation; leg vestiture somewhat weaker than on male; abdominal tergum 1 with similar colour pattern.

Remarks. *Bandella montana* occurs along the Great Dividing Range from southern Victoria to the New England escarpment in northern New South Wales. The extent of the black area on the mesonotum appears to vary in size geographically. Specimens from the southern part of the range (Blue Mountains, N.S.W. and Thompson River, Vic.) have the black area reduced to a narrow median strip, whereas specimens from the New England escarpment have a more extensive black area, as in Fig. 2c.

Bandella noorinbee n.sp.

Figs. 2d, 2e, 3e, 3f

Type material. HOLOTYPE ♂, PARATYPES 2♂, 11♀, Victoria: Noorinbee, 12.xi.1969, A. Neboiss (all MVM).

Additional material. New South Wales: 3♂, 6.4 km N of Batemans Bay, 14.x.1952, 22.x.1952, 14.x.1959; ♂, Macquarie Falls, 14.xi.1960, 2♀, Warrell Creek, 11.x.1962 (ANIC). ♂, Mt Royal SF, nr Pieries Ridge, 600–700 m, 15.xi.1986; ♀, 30 km N of Taree, 23.xi.1985 (AMS); ♂, Royal NP, Couranga Trail, 7.xi.1993 (CNC).

Description (male): length: 7.2–7.3; wing: 5.0×1.5. *Head*: post-cranium, vertex and frons shining black with no pruinosity; ventral postcranium with scattered pale setae; postorbitals reduced to short hairs, white ventrally, black dorsally; face covered with silvery pruinosity; labrum yellowish with dark brown base and apex, labellum black; antenna black brown; scape and pedicel setose.

Thorax: pleura and humeral areas of mesonotum red-yellow; mesonotum mostly black posteriorly, narrowing step like anteriorly, to become black stripe over ac band and pronotum (Fig. 2d); scutellum black; postnotum black but covered with grey pruinosity; setulae pale; scutellum with pair short median marginal setae, and with some adjacent short setae.

Legs: coxae yellow; trochanters and remainder of legs dark brown to black; coxae with only short pale vestiture, no strong setae; all tarsi with strong black claws and large yellowish pulvilli; I: 6.7; 7.0; 3.6/ 1.2/ 1.0/ 0.9/ 0.8; FI and TI mostly with short vestiture; TI without anteroapical comb; TI, It_1, and It_2 each with 2 pairs of av-pv setae, and It_3 each with single pair of av-pv setae; II: 6.7; 7.0; 3.0/ 1.4/ 1.0/ 0.9/ 0.7; TII with pair strong apical av-pv setae setae; each tarsomere IIt_{1-3} with apical av-pv setae; IIt_1 with black

ventral pile; remainder of tarsus II with dense pale ventral pile; III: 11.0; 10.0; 3.0/ 1.3/ 1.0/ 0.8/ 0.8; FIII gradually expanding apically, and weakly clavate in distal third; TIII without strong setae; IIIt with short black vestiture.

Abdomen entirely shining black, with metallic blue-violet reflections; without pruinosity; tergum 7 with distal U-shaped excavation; tergum and sternum 8 unmodified; hypopygium (Fig. 3e); male cercus divided into short basal cercal plate and rather broad clasping cercus.

Female similar to male except as noted: face and clypeus both wider; thorax including scutellum and postnotum entirely yellow, without any black markings (Fig. 2e); vestiture of tarsus I and II not as strongly developed; oviscapt Fig. 3f.

Remarks. *Bandella noorinbee* is known from coastal and lowland sites from the northern coast of New South Wales to East Gippsland, Victoria. All specimens were collected in October and November. This species shows strong sexual dimorphism in mesonotal pattern: males have an extensive black area (Fig. 2d), whereas females have an entirely yellow mesonotum (Fig. 2e).

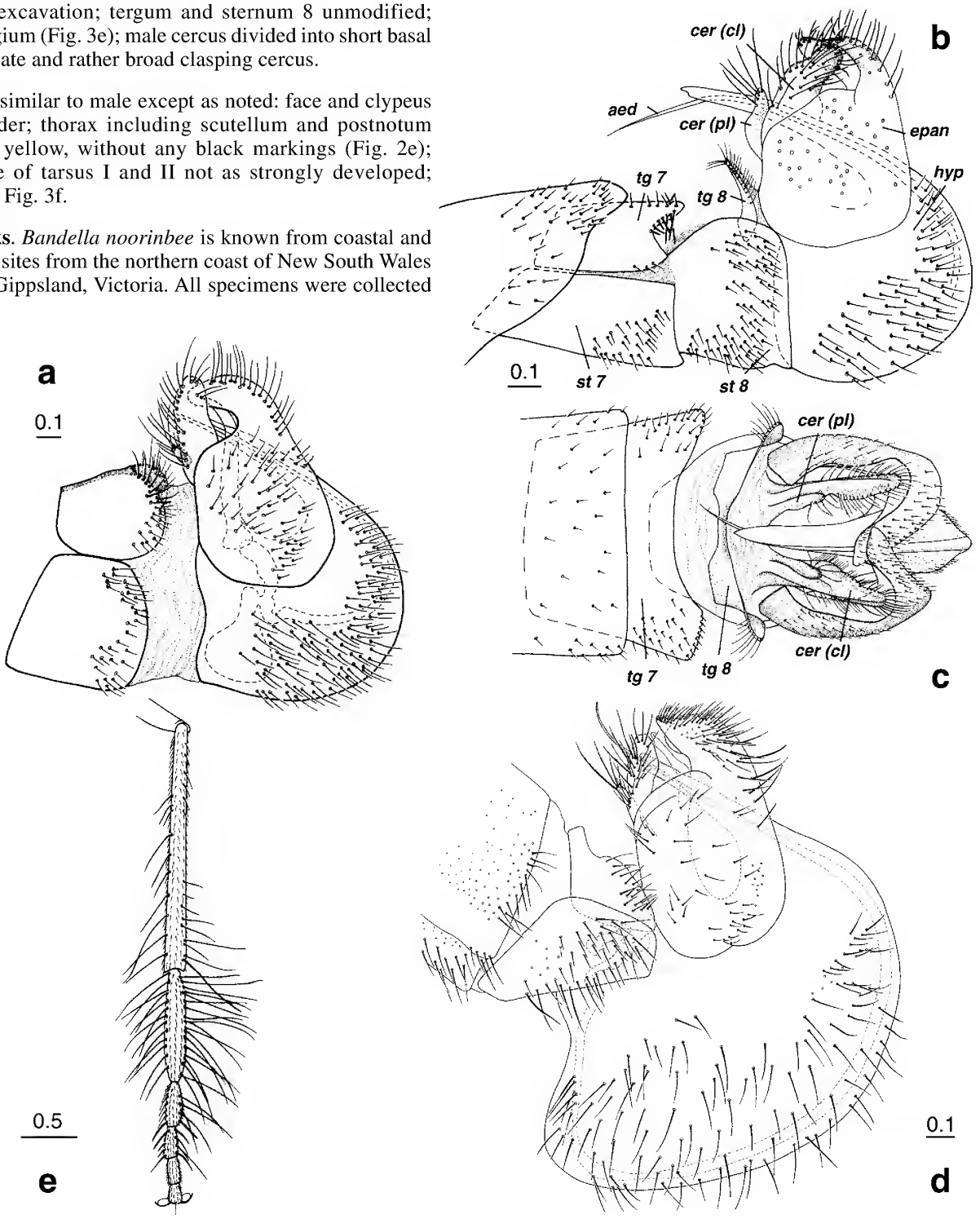

Figure 4. *Bandella tasmanica*: a, male postabdomen, left lateral. *Bandella duvalli*: b, male postabdomen, left lateral; c, male postabdomen, dorsal. *Bandella maxi*: d, male postabdomen. *Bandella costalis*: e,. male right tibia and tarsus II, dorsal. Legend: aed, aedeagus; cer (cl), clasping cercus; cer (pl), cercal plate; epan, epandrium; hyp, hypandrium; tg, tergum; st, sternum.

Bandella maxi n.sp.

Figs. 2g, 4d

Type material. HOLOTYPE ♂ (K 173140), Queensland: Mt Lewis, Mt Lewis Rd nr forestry hut, 1100 m, 10.xii.1974, at light, M.S. Moulds (AMS).

Description (male): length: 10.0; wing: 7.5×2.2. *Head*: post-cranium, vertex and frons shining black with no pruinosity; ventral postcranium with scattered pale setae; postorbitals reduced to short hairs, white ventrally, black dorsally; face as wide as frons and covered with silvery pruinosity; palp yellow with white setae, curved and slightly clavate; proboscis yellow with dark brown apex, elongate, length about one and a half head height, and projecting ventrally; antenna dark brown.

Thorax: pleura and anterior mesonotum mostly red-brown; anterior mesonotum red, interdigitating with black posterior mesonotum (Fig. 2g); scutellum black with reddish margin; postnotum black, posterior slope of mesonotum covered with field of short setulae.

Legs: coxae mostly reddish yellow; but CIII laterally infuscated; coxae with only short pale vestiture, no strong setae; all tarsi with strong black claws and large yellowish pulvilli; I: 9.0; 9.8; 5.0/ 2.1/ 1.5/ 1.8/ 1.4; leg I mostly red-yellow; FI and TI mostly with short vestiture; TI without anteroapical comb; TI and It_1 each with 2–3 pairs of apical av and pv setae, It_2 and It_3 each with single av-pv setal pair; all of tarsus I with pale ventral pile; II: 10.0; 10.5; 4.5/ 1.8/ 1.3/ 1.4/ 1.0; FII mostly reddish yellow but infuscated in distal half; TII and IIt_1 red-yellow; distal tarsomeres II dark brown; TII with pair strong av setae; each tarsomere IIt_{1-3} with apical av-pv setae; IIt_3 and IIt_4 with dense pale ventral pile; III: 13.5; 13.0; 5.0/ 2.0/ 1.3/ 1.5/ 1.3; FIII yellowish in basal half but distally dark brown; TIII yellow in basal third, and with distal two-thirds of TIII, and all IIIt dark brown; FIII gradually expanding apically, and weakly clavate in distal third; TIII without strong setae; IIIt with short black vestiture.

Abdomen: terga 1 and 2 reddish, remainder of abdomen black; cuticle glabrous, without pruinosity; segment 7 with well-developed tergum and sternum, tergum 7 not excavated; nor differentiated from segments anteriad; tergum 8 reduced to narrow band; sternum 8 unmodified; hypopygium (Fig. 4d).

Female unknown.

Remarks. *Bandella maxi* is known only from submontane rainforest above 1000 m on Mt. Lewis, in the Queensland wet tropics. It has a greatly expanded and keel-like hypopygium.

However, male abdominal segments 7 and 8 are relatively unmodified, and therefore plesiomorphic with respect to the other *Bandella* species. This species is named for the collector, Max Moulds.

Bandella duvalli n.sp.

Figs. 1, 2h, 2i, 4b, 4c

Type material. HOLOTYPE ♂, Tasmania: 14 km SW by S of Wilmot, 41°30'S 146°05'E, 31.i.1983, I.D. Naumann & J.C. Cardale (ANIC).

Additional material. Tasmania: ♂, Arthur Plains, 18.ii.1965; ♀, Mt Bowes, NE slope, 11.ii.1965 (MVM); ♂, Mt Wellington, Hobart, 42°55'S 147°14'E, 1.ii.1992, 720 m, on *Leptospermum scoparia* (UQIC); ♀, Cradle Valley, 26.i.1923; ♂, Strahan, 6.ii.1923; ♀, Mt Farrel, 9.ii.1923; ♂, Mt. Field NP, 950 m, 22.ii.1963 (ANIC); ♂, Mt Barrow, 41°22'S 147°25'E, 900 m, 12.ii1988 (AMS).

Description (male): length: 10.0; wing: 7.5×2.2 (habitus, Fig. 1). *Head*: post-cranium black, covered laterally and ventrally with grey pruinosity; dorsal post-cranium, vertex and frons black without pruinosity; postcranium with usual pale ventral hairs and with black dorsal hairs; postorbital setae white ventrally, black dorsally; lateral frons with setulae more distinct than usual; palp yellow with white setae, curved and slightly clavate; labrum dark brown basally, yellow distally; labellum dark brown; antenna black; scape and pedicel with short black setulae.

Thorax: pleura mostly black but red-brown near sutures, and covered with grey pruinosity; anterior mesonotum red-brown, interdigitating with black posterior mesonotum, black lateral patches and black ac band, but in some specimens this pattern is obscured (Fig. 2h,i); scutellum red-brown with black base; postnotum black with grey pruinosity; posterior slope of mesonotum covered with field of short setulae.

Legs: coxae dark brown to black although CI and CII reddish brown distally; coxae with only short pale vestiture, no strong setae; all tarsi with strong black claws and large yellowish pulvilli; legs I and II mostly red-yellow; It_{1-3}, each with pairs of av setae; each tarsomere IIt_{1-3} with some subapical av setae; FIII yellowish in basal two thirds, but dark brown and slightly clavate in distal third; TIII yellow at base, dark brown from ⅓–⅚, and yellow in distal sixth; distal sixth of TIII and $IIIt_1$ with pale yellow vestiture; $IIIt_{2-5}$ with black vestiture.

Abdomen: tergum 1 black; preabdomen translucent red-brown, with some specimens showing black areas laterally and dorsally on terga 4 and 5; cuticle glabrous, without pruinosity; tergum 7 only slightly excavated; tergum 8 with lateral flaplike projections; sternum 8 unmodified; hypopygium mostly black (Fig. 4b,c).

Female similar to male except as noted: frons wider, thorax with black markings smaller in extent; leg and vestiture colour similar; abdomen mostly orange in colour.

Remarks. *Bandella duvalli* is known from various locales in western Tasmania, mostly in upland areas. There is some intraspecific variation in the intensity of mesonotal infuscation among the specimens, as shown in Fig. 4b and 4c.

This species named in honor of Steven G. Duvall of California, who helped sponsor this research.

Bandella tasmanica n.sp.

Figs. 2j, 4a

Type material. HOLOTYPE, ♂, Tasmania: Pelion Gap, 2 km ENE of Mt Ossa, 41°52'S 146°03'E, 1120 m, 7.iii.1991–9.iv.1991, malaise trap, E. Edwards & J. Berry, ANIC. PARATYPES: 2♂, same data as holotype; 1♂, Pelion Hut, 3 km S of Mt Oakleigh, 41°50'S 146°03'E, 860 m, iii.1991, malaise trap; 1♂, Pelion Hut, same data but 6–11.iii.1991, pans (all ANIC).

Additional material. Tasmania: ♀, Derwent Bridge, 12.ii.1967 (ANIC).

Description (male): length: 11.0–11.5; wing: 8.0×2.2; similar to *B. duvalli*, except as noted. *Head* also with black hairs on dorsal postcranium, scape and pedicel.

Thorax: pleura and postnotum black and covered with dense grey pruinosity; anterior mesonotum mostly orange; but with black ac band which continues and is slightly wider across posterior slope to scutellum; large black spot laterad of dc row and posteriad of mesonotal suture, and black pa spot, which is sometimes only weakly developed (Fig. 2j); postpronotum and postalar callus pale yellow; scutellum orange but dark brown at base; dc band with short setulae extending to scutellum, and with some short setulae laterally.

Legs: coxae mostly reddish yellow; but CII and CIII infuscated at very base; trochanters yellow with dark brown apices; all femora and tibiae reddish yellow, except TIII with brown band from ⅗ to ¾ which varies somewhat in extent; It brownish, IIt mostly yellow, IIIt yellow; coxae with only short pale vestiture, no strong setae; all tarsi curled in repose; It_{1-3} each with pairs of ad-pd setae; $IIIt_1$ ventrally with dense pale pile and some short dark setulae.

Abdomen: tergum 1 black; segments 2–6 entirely orange-yellow; tergum 8 also with lateral flaplike projections; hypopygium (Fig. 4a) mostly yellow except for dark brown apex and edge of hypandrial keel and apices of epandrium and cercus.

Female. Putative female specimen similar to male except as noted: thoracic pleura with mixed black and yellow patches, and with distal postnotum black; mesonotum entirely orange with only dark brown ac stripe present, thinner than that of male; leg colour similar and TIII also with brown band.

Remarks. *Bandella tasmanica* is known only from the Central Highlands of Tasmania, and most specimens were collected near Mt. Pelion. This species is close to *B. duvalli*, but the two species can be readily separated by the set of diagnostic key characters: the pattern of the mesonotum, and colour of coxae and abdomen. Both species have a similar banded tibia III and have a short flap like tergum 8, that rests against the hypopygium.

Bandella costalis n.sp.

Figs. 2k, 4e

Type material. HOLOTYPE, ♂, PARATYPE, ♀, Western Australia: 11 km S of Pemberton, 34°32'S 116°02'E, 6.x.1981, I. Naumann & J. Cardale (both ANIC).

Additional material: Western Australia: 3♂, 3♀, 10 km N of Walpole, 7.x.1970; 7♂, 6♀, Nornalup NP, 9.x.1970, coll. D.H. Colless, ANIC.

Description (male): length: 10.0; wing: 7.5×2.2. *Head*: vertex and frons shining black with no pruinosity; ventral postcranium with scattered pale setae; postorbitals as short hairs, white ventrally, black dorsally; face covered with silvery pruinosity; labrum yellow, labellum dark brown; antenna dark brown; scape and pedicel setose.

Thorax: pleura black, although meron and laterotergite with large yellowish areas, and covered with grey pruinosity; mesonotum and scutellum entirely black and shining with no pruinosity (Fig. 2k); postnotum black but covered with grey pruinosity; entire mesonotum with only setulae, no major setae present; ac band narrow, 2–3 setulae wide, with bare cuticle each side of this band extending to posterior slope, and with narrow dc row.

Legs: coxae mostly reddish yellow; remainder of legs yellow, except apex of trochanters and very base of femora black, and distalmost tarsomeres infuscated; coxae with only short pale vestiture, no strong setae, remainder of legs with black vestiture; TI with pair apical av-pv setae, It_1 with very long posterior setae, and with slightly longer than normal anterior setae; It_{2-3} each with 2–3 pairs of long anterior and posterior setae (MSSC); TII (Fig. 4e) in distal half with some long anterior and posterior setae, and apically with some strong av, pv and ventral setae (MSSC); IIt_1 with very long anterior and posterior setae, and It_{2-3} with long posterior setae only (both MSSC); IIt_{4-5} unmodified (MSSC); FIII slightly clavate in distal half; TIII with some irregular long setae, especially ventrally (MSSC); $IIIt_1$ with long posterior setae (MSSC), but not as long as those of IIt_1; $IIIt_2$ with 3–4 long posterior setae, and $IIIt_3$ with some long apical setae (MSSC); $IIIt_{4-5}$ unmodified.

Wing: stigma brownish and diffuse.

Abdomen: terga yellowish with dark-brown to black posterior borders, and with weak dorsal infuscation; postabdomen (not figured) with tergum 8 developed into lateral flap-like projection; hypopygium mostly yellow, with somewhat enlarged hypandrial keel which projects posteriorly.

Female similar to male except as noted: face slightly wider; tibiae and tarsi with only short unmodified vestiture, without long anterior and/or posterior setae.

Remarks. *Bandella costalis* is known from wet sclerophyll karri forests in southwestern Western Australia. Male tibiae and tarsi variously have long anterior and/or posterior setae, especially well developed on leg II (Fig. 4e).

Bandella albitarsis n.sp.

Figs. 2f

Type material. HOLOTYPE, ♂, New South Wales: New England NP, 13.x.1962, D.H. Colless (ANIC).

Additional material. New South Wales: ♀, Dorrigo NP, 15.x.1966 (ANIC); ♂, Blue Mountains, Blackheath, x.1930 (MVM).

Description (male): length: 8.0; wing: 7.5×2.2. *Head*: post-cranium shining black, with silvery pruinose band around outer rim except near vertex; frons shining black with no pruinosity; ventral postcranium with scattered pale setae; postorbitals entirely white, within silvery pruinose band; face covered with golden pruinosity; labrum and labellum yellow; scape and pedicel yellow-brown; first flagellomere dark brown.

Thorax: cuticle glabrous with little pruinosity; pleura and mesonotum mostly red-brown, but mesonotum with black areas laterally, and with pale yellow humeral, pronotal and notopleural areas (Fig. 2f); scutellum orange; postnotum mostly dark brown; distinct patches of orientated silvery pruinosity visible in posterolateral view on following thoracic areas: middle of postnotum, anatergite, meron, and area of anepisternum just anteriad of wind base; posterior slope of mesonotum with scattered short setulae.

Legs: coxae, trochanters and all femora reddish yellow except trochanters with black apices; leg vestiture mostly yellowish; coxae with only short vestiture, no strong setae; all tarsi with strong black claws and large yellowish pulvilli; TI and It_1 dark brown to black with reddish vestiture, in sharp contrast to the ivory white It_{2-5}; TI and each tarsomere It_{1-3} with some short av-pv setae; TI without distinct anteroapical comb; It_1 slightly swollen (MSSC); TII and tarsus II red yellow; TII with ad row of 8–10 short yellowish setae along length; IIt_{1-3} each with some short av-pv setae; IIt_3 and IIt_4 with dense pale ventral pile; TIII and $IIIt_1$ red yellow, and $IIIt_{2-5}$ distinctly pale yellow; FIII not clavate; IIIt with short vestiture.

Abdomen entirely red-brown, with some brownish infuscation distally; cuticle glabrous, without pruinosity; tergum 7 slightly excavated distally; hypopygium (not figured) almost entirely yellow.

Female similar to male except as noted: post-cranium also with silvery pruinose band around outer rim; thorax of similar colour and with similar pruinose patches; TI yellowish basally but dark brown in distal half; It_1 black but not swollen; tarsomeres t_{2-5},on all three legs distinctly white; leg vestiture somewhat weaker than on male.

Remarks. *Bandella albitarsis* is known from the Dorrigo Escarpment in northeastern New South Wales, and the Blue Mountains west of Sydney, both at elevations above 750 m. All specimens were collected in October.

This species has several diagnostic characters, developed in both sexes: (*a*) Bright silvery pruinose areas are distinctly visible in oblique view on the following areas: a band around the rim of the postcranium, middle of the postnotum, the anatergite, most of the meron, and the area of anepisternum just anteriad of wing base. These silvery patches may facilitate mating in flight, especially since incident light would make them appear to "flash" while turning. (*b*) Leg I has tarsomeres 2–5 ivory white in both sexes. In males, tarsi II and III are mostly yellow, whereas in females, all tarsomeres 2–5 on legs III and III are distinctly white. The white distal tarsomeres are more strongly developed on females than males, and should be regarded as a female secondary sexual character (FSSC) that is only weakly developed in males.

The male from New England National Park had *Leptospermum* pollen on its proboscis, and probably was nectar feeding.

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Three New Species of *Psaltoda* Stål from Eastern Australia (Hemiptera: Cicadoidea: Cicadidae)

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ABSTRACT. *Psaltoda antennetta* n.sp. and *P. maccallumi* n.sp. are cicadas restricted to rainforest habitats in northeastern Queensland. *Psaltoda mossi* n.sp. is far more widespread, ranging through eastern Queensland to northern New South Wales. *Psaltoda antennetta* is remarkable for its foliate antennal flagella, an attribute almost unique among the Cicadoidea. Relationships of these three species are discussed and a revised key to all *Psaltoda* species provided.

MOULDS, M.S., 2002. Three new species of *Psaltoda* Stål from eastern Australia (Hemiptera: Cicadoidea: Cicadidae). *Records of the Australian Museum* 54(3): 325–334.

The genus *Psaltoda* Stål is endemic to eastern Australia. Twelve species have been recognised previously (Moulds, 1990; Moss & Moulds, 2000). Three additional species are described below including one that differs notably from other *Psaltoda* species (and nearly all other Cicadoidea) in having foliate antennal flagella.

In a previous review of the genus (Moulds, 1984) a key was provided to the species then known. That key is here revised.

Collections where specimens are house are abbreviated as follows: AE, private collection of A. Ewart, Brisbane; AM, Australian Museum, Sydney; ANIC, Australian National Insect Collection, Canberra; ASCU, Agricultural Scientific Collections Unit, NSW Agriculture, Orange; BMNH, The Natural History Museum, London; DE, private collection of D. Emery, Sydney; JM, private collection of J. Moss, Brisbane; JO, private collection of J. Olive, Cairns; LWP, private collection of L.W. Popple, Brisbane; MC, private collection of M. Coombs, Brisbane; MNHP, Museum national d'Histoire naturelle, Paris; MSM, author's collection; MV, Museum of Victoria, Melbourne; QM, Queensland Museum, Brisbane; UQIC, University of Queensland Insect Collection, St Lucia. Names of collectors of specimens are abbreviated as follows: JM, J. Moss; MBM, M.S. & B.J. Moulds; WH, A. & M. Walford-Huggins; AH, A. Hiller; AE, A. Ewart and EA, E.E. Adams.

Measurements (in mm) are given as a range and mean, and include the smallest and largest available specimens.

Key to species of *Psaltoda*

1 Hind wings infuscated apically 2
—— Hind wings not infuscated apically 8

2 Head not black behind ocelli 3
—— Head black behind ocelli 4

3 Fore wings with infuscation overlaying longitudinal veins at their junction with ambient vein ..... *adonis* Ashton
—— Fore wings without infuscation overlaying longitudinal veins at their junction with ambient vein ..... *fumipennis* Ashton

4 Lateral ocelli with at least a brown spot adjacent, the brown often more extensive ..... *flavescens* Distant
—— Lateral ocelli with black adjacent all around 5

5 Head with a black bar of near uniform width for its length between lateral ocellus and eye ..... *magnifica* Moulds
—— Head either entirely jet black or with a black bar widening gradually from lateral ocellus to eye 6

6 Abdomen dorsally dominantly orange (dull brown on discoloured specimens) ..... *aurora* Distant
—— Abdomen dorsally black or nearly so 7

7 Rostrum reaching clearly beyond distal ends of hind coxae ..... *moerens* (Germar)
—— Rostrum not reaching or just reaching distal ends of hind coxae ..... *pictibasis* (Walker)

8 Rostrum reaching to, or beyond, distal ends of hind coxae ..... *harrisii* (Leach)
—— Rostrum not reaching distal ends of hind coxae 9

9 Abdomen dorsally black or nearly so 10
—— Abdomen dorsally not dominantly black, usually light to mid brown or banded black and brown 13

10 Head and thorax dorsally with prominent light yellow (sometimes pale brown) markings very clearly defined ..... *insularis* Ashton
—— Head and thorax dorsally with markings subdued, never light yellow and usually not clearly defined 11

11 Mid-dorsal head length greater than, or sometimes equal to, that of pronotum excluding pronotal collar ..... *mossi* n.sp.
—— Mid-dorsal head length less than that of pronotum excluding pronotal collar 12

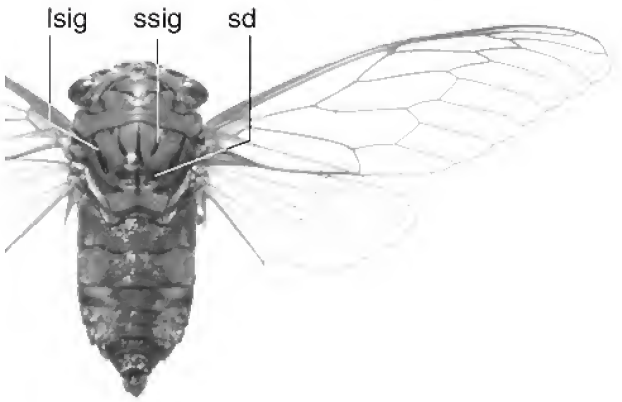
12 Fore wing with infuscation at bases of apical cells 2 and 3 ..... *plaga* (Walker), dark form
—— Fore wing without infuscation ..... *claripennis* Ashton, dark form

13 Antennae bristle-like 14
—— Antennae foliate distally ..... *antennetta* n.sp.

14 Fore wing with infuscation at bases of apical cells 2 and 3 and sometimes also on longitudinal veins meeting ambient vein 15
—— Fore wing without infuscation 16

15 Black bar from eye towards ocelli meeting black surrounding median ocellus ..... *plaga* (Walker), green form
—— Black bar from eye towards ocelli not reaching black surrounding median ocellus ..... *maccallumi* n.sp.

16 Length of fore wing less than 3× its breadth; male opercula usually separated but sometimes contiguous ..... *brachypennis* Moss & Moulds
—— Length of fore wing at least 3× its breadth; male opercula usually overlapping but sometimes only contiguous ..... *claripennis* Ashton, green form, or female of dark form.



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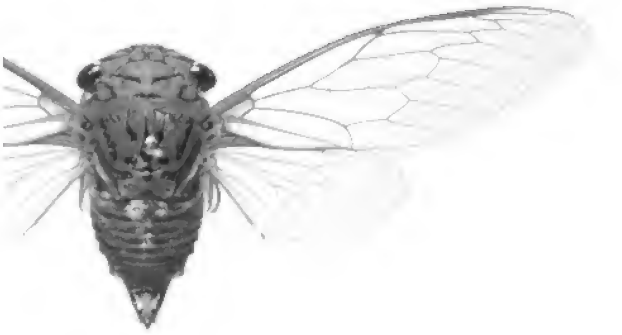

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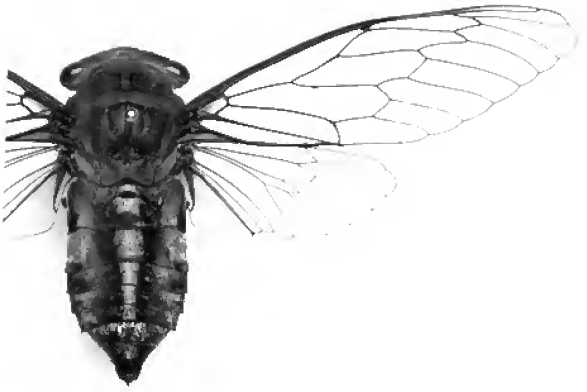

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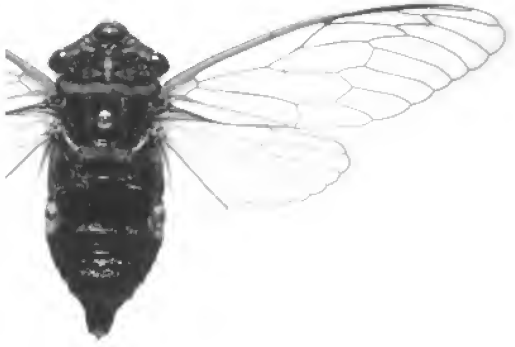

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Figures 1–6. Adults, dorsal view. 1, *Psaltoda antennetta*, male; 2, same, female. 3, *Psaltoda maccallumi*, male; 4, same, female. 5, *Psaltoda mossi*, male; 6, same, female. Approximately 1.3× life size. lsig, lateral sigilla; sd, scutal depression; ssig, submedian sigilla.

Psaltoda antennetta n.sp.

Figs 1, 2, 7, 8, 9, 15

Type material. HOLOTYPE male, Tully Falls, S of Ravenshoe, N.Qld, 11.i.1977, M.S. & B.J. Moulds, K 173149 (**AM**). PARATYPES as follows: QUEENSLAND (northeastern): 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 25.xii.1976, MBM; 1♂, Copperlode Dam clearing, Whitfield Range, Cairns, 24.i.1973, WH (**AM**). 2♀, 20 miles W. of Tully, 20.iv.1964, I.F.B. Common & M.S. Upton; 1♂, 1♀, Palmerston Nat. Park, 17 miles SW of Innisfail, 21.xii.1976, R. Dobson; 1♂, W. slopes of Seymour Ra. Dinner Ck Rd nr. Innisfail, 150ft, 3.xi.1966, E. Britton (**ANIC**). 1♀, Mt Hartley, nr Rossville, S of Cooktown, 1.i.1984, MBM; 1♂, "Pilgrim Sands", Cape Tribulation, 24.v.1983, J. Frazier, D. Clyne; 1♂, 2♀, Mt Lewis, nr Julatten, i.1986, S. Lamond; 2♂, Julatten, NE of Mt Molloy, 20.ix.1987, 2.xii.1987, Walford-Huggins; 1♀, Julatten, foot of Mt Lewis Rg, 8.ii.1981, A. Walford-Huggins; 1♂, Julatten, 3.iii.1982, MBM; 2♂, 1♀, Davies Ck, nr Mareeba, 650 m, rainforest, 7.i.1980, A. Hiller; 1♀, Davies Ck Rd, nr Mareeba, 8.i.1980, Graham Wood; 1♂, 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 25.xii.1976, MBM; 1♂, 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 29.xii.1977, A. Hiller; 1♂, Mt Fisher, nr Milla[a] [Millaa], 10.xii.1978, WH; 1♀, Mt Fisher, 8 km SW of Millaa Millaa, 21.xi.1979, MBM; 1♂, Zillies Falls, 16 km NE of Millaa Millaa, 650 m, rainforest, 18.i.1980, A. Hiller; 1♂, nr The Crater, 20 km S of Atherton, 29.xi.1987, D.A. Lane; 1♀, Baldy Mtn, Atherton, 8.xii.1977, A. Walford-Huggins; 1♂, Herberton, 1.xii.1980, G. Wood; 1♂, Ravenshoe, i.1986, S. Lamond; 2♂, Tully Falls, S of Ravenshoe, 12.xii.1976, M. Walford-Huggins; 1♂, Tully Falls, Atherton Tablelands, rainforest, 27.xii.1979, A. Hiller; 1♂, 1 km N Tully Falls, 8.i.1976, A. & M. Walford-Huggins; 1♂, Copperlode Dam clearing, Whitfield Range, Cairns, 24.i.1973, WH; 2♂, Whitfield Range, Cairns, 24.i.1973, 3.i.1975, WH; 1♂, Crystal Cascades nr Redlynch, 14.xii.1975, B. Brunet; 1♀, Mt Bartle Frere, NW Peak, xii.1985, G. Sankowsky; 1♀, 30 km NW of Kennedy, 800 m, rainforest by creek, 24.xii.1979, A. Hiller; 1♀, 15 km W of Kennedy, 650 m, rainforest, 26.i.1980, A. Hiller; 1♂, nr Mt Fox, SW of Ingham, edge of rainforest, and *Eucal. grandis*, 550 m, 22.xii.1986, J. Young (**MSM**). 2♀, Julatten, i.1981, JM; 1♂, 21 km NE of Atherton, 18.xi.1981, J. Balderson; 1♀, Tully Falls Rd, Ravenshoe, 8.ii.1980, R.I. Storey; 1♀, Gordonvale (Goldsborough Rd, Upper Mulgrave R.), 26.xii.1981, JM (**JM**). 1♀, Tully, 24.iv.1931, A.N. Burns (**MV**). 1♂, Rifle Ck at Black Mtn, 18 km ESE Julatten, 13–14.iv.1982, RF, 400 m, Monteith, Yeates & Cook; 1♀, Bellenden-Ker Range, 5 km S Cable Tower No7, 500 m, 17–24.x.1981, Earthwatch/Qld Museum (**QM**).

Distinguishing characters. The markedly foliate antennae (Fig. 7) clearly separate this species from all others. Males have a wide gap between the opercula and tymbal covers, a feature shared within *Psaltoda* only with *maccallumi* and *brachypennis*. See also Distinguishing Characters under *P. maccallumi*.

Description

Male (Figs 1, 7, 8, 9). *Head.* Mid brown tending partly green on some individuals, live specimens always partly green; posterior margin of head partly or entirely edged black; ocellar triangle black, sometimes expanded to posterior margin of head and sometimes with an anterior "finger" either side of median ocellus directed towards lateral margins of postclypeus; a broad black fascia on vertex from eye to ocellar tubercle where it meets a short black transverse fascia that sometimes extends to posterior margin of head; narrow black margin to eyes above; usually a short black fascia dorsally on antennal plates; sometimes a black mark below antennal cavity. Postclypeus glossy; yellowish brown, a broad black fascia dorsally across base, ventral midline black, transverse ridges edged black becoming less so or unmarked nearing anteclypeus. Anteclypeus glossy; yellowish brown, usually with a little black adjacent to postclypeus in vicinity of midline. Rostrum with labrum black, mentum yellowish brown to mid brown, otherwise yellowish brown to dark brown becoming black apically; reaching just beyond bases of hind coxae. Eyes of live specimens light reddish brown. Antennae (Fig. 7) with segment 3 mildly compressed laterally; segments 4 and 5 strongly compressed; segments 6–8 markedly flattened, spatulate, 6 very broad and long, 7 considerably smaller, 8 very small.

Thorax. Pronotum mid brown tending green on some individuals, pronotal collar often green and possibly always so on live specimens; median and lateral fissures black; posterior transverse fissure black around dorsal midline and laterally below junction with lateral groove; on some individuals a paramedian pair of black fascia expanded laterally at both ends, reaching pronotal collar but never to anterior margin of pronotum. Mesonotum similar in colour to pronotum; midline with a black fascia broadest a little anterior of cruciform elevation and often extending partly onto cruciform elevation; posterior margin of cruciform elevation sometimes edged black across dorsal region; lateral sigilla incompletely marked, black along outer margin only, the black increasing in width towards apex; submedian sigilla incompletely marked, black along outer margin, to a lesser extent across base and sometimes partly along inner margin, the black irregular in outline; scutal depressions boldly marked black; wing grooves black. Underside of thorax mid brown, often substantially covered by silver pubescence.

Wings. Hyaline, usually with very faint smoky tint, usually without infuscations but occasionally present on veins forming bases of apical cells 2 and 3. Fore wing venation brown, 2A+3A black or partly so, some individuals with veins R+Sc, M, CuA and CuP+1A green or partly so; basal cell translucent brown, darkest on anterior half; basal membrane dark brown. Hind wing venation usually brown, sometimes partly green; plaga on 3A black, almost reaching distal end of 3A; plaga on 2A black, very narrow, reaching full length.

Legs. Glossy; dominantly yellowish brown or greenish, partly black or dark brown. Fore legs with femoral primary spine short, rounded and not lying flat, secondary spine barely developed; browning at distal end of tibia; tarsus black or dark brown; pretarsal claws dark brown and black. Mid legs similar to fore legs but black reduced. Hind legs lacking black except on spines and pretarsal claws. Meracantha yellowish brown.

Opercula. Triangular, lateral and hind margins almost straight, lateral angle near a right-angle; meeting or overlapping; glossy; yellowish brown.

Abdomen. Tergites tending glossy; light brown; tergites 1 and 2 with narrow black edgings at their junction in dorsal region; tergites 2 and 3 with narrow black edgings for the length of their junction; tergites 2–8 black on anterior margins, broadest in dorsal region, but for the most part concealed unless abdomen is extended; tymbal covers distant from opercula; mid brown. Sternites glossy; yellowish brown; anterior margin of sternite 3 narrowly edged black. Spiracles white.

Genitalia (Figs 8, 9). Thickening of lower rim of pygofer considerable, more than twice thickness of remainder. Pygofer basal lobe lying tight against upper lobe; upper lobe not well developed, broad but very short, very rounded in lateral view. Uncus with distal expansion occupying around half the length of uncal median lobe; distal margin of uncal median lobe in dorsal view strongly V-shaped; in lateral view nearly straight along dorsal midline and with the ventral distal expansion not markedly bulging (compare Figs 8 and 12). Aedeagus similar to that of other *Psaltoda* species.

Female (Fig. 2). Similar to male except abdomen tending darker; black on the tergites a little more extensive. Abdominal segment 9 with a large black subdorsal marking on anterior half fused dorsally at anterior margin, ventral margin usually black; caudal spine and distal margin of segment 9 black; stigma black. Ovipositor sheath black; terminating before apex of caudal spine.

Measurements. n = 10♂, 10♀ (includes largest and smallest of available specimens). *Body length*: male 24.6–31.8 (29.0); female 24.4–28.8 (26.2). *Fore wing length*: male 34.8–39.9 (37.5); female 37.2–41.6 (39.7). *Head width*: male 11.2–13.1 (12.3); female 11.9–13.8 (12.7). *Pronotum width*: male 10.2–11.7 (11.0); female 10.6–12.9 (11.6).

Distribution and habitat (Fig. 15). Northeastern Queensland between Mt Hartley south of Cooktown and Mt Fox southwest of Ingham. The species inhabits primary rainforest, both in the lowlands and the mountains, usually below 1000 m but up to 1470 m. Adults have been taken from mid October to late May.

Etymology. The specific epithet is derived from the word antenna and refers to the unique foliate antennae of this species.

Comments

Although the antennal flagellum of this species is unique within *Psaltoda*, and very unusual within the Cicadoidea, all other characters clearly place it within *Psaltoda*. Notable amongst these characters are the broad head (clearly wider than the mesonotum), a broad pronotal collar with strongly ampliate lateral margins, enlarged abdominal tergites 2 and 3 which account for as much as half the length of the abdomen and very flat male sternites IV–VII. Further, the male genitalia have a distinctive uncal lobe which, in dorsal view is broad with an expanded broad apex, and restraint of the aedeagus is by sinewation of the inner pygofer wall adjacent to the ventral surface of the uncus; attributes shared only with *Anapsaltoda* and *Neopsaltoda*.

Two South American species, *Mendozana antennaria* (Jacobi) and *M. platypleura* Distant, are the only other species known to me with a similarly modified flagellum. The modification differs noticeably between these two species, that of *M. antennaria* is primarily confined to a relatively small expansion of segment 6, while that of *M. platypleura* constitutes a large expansion of 7 and 8 as in *Psaltoda antennetta* n.sp. *Mendozana* species are rather distant phylogenetically from *Psaltoda* (Moulds, in prep) falling within a group of Neotropical genera allied to *Tettigades* Amyot and Serville [recognised by some authors (e.g., Chou *et al.*, 1997) at family or subfamily rank] and differing markedly from *Psaltoda* in having males with tymbal covers absent and abdominal tergites 2 and 3 similar in size to 4–7. Thus, it must be concluded, modification of the distal end of the flagellum has arisen independently in *P. antennetta* and *Mendozana* species.

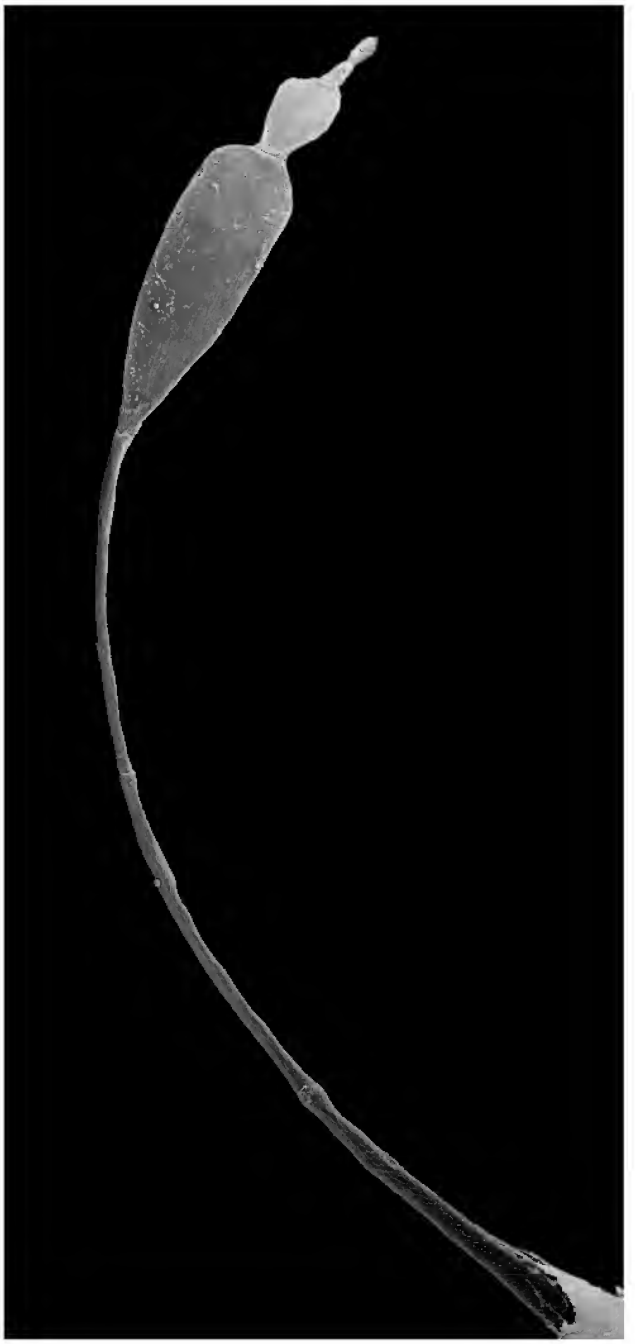


Figure 7. Antennal flagellum of *Psaltoda antennetta* showing foliate distal segments. Magnification 350×.

Psaltoda maccallumi n.sp.

Figs 3, 4, 10, 11, 14

Type material. HOLOTYPE male, Mt Lewis Rd, via Julatten, 11.xi.1987, Walford-Huggins, K 173141 (AM). PARATYPES as follows: QUEENSLAND (northeastern): 1♀, Mt Lewis road, W of Mossman, N.Qld, 25.xii.1987, MBM; 1♀ Mt Lewis Rd, via Julatten, 11.xi.1987, Walford-Huggins; 1♂, Mt Lewis, 22.xii.1985, WH; 1♀, 13 miles, 3,400[feet], Mt Lewis, 8.xi.1975, WH; 1♀, Mt Spurgeon, W of Mossman, 21.xii.1974, M.S. Moulds (MSM).

Distinguishing characters. Clearly distinguished from the closely allied *P. antennetta* by having typical bristle-like antennae. The meracantha are also characteristically black basally with a very pale spine, unlike the meracantha of *P. antennetta* which are entirely pale. Males have the opercula and tymbal covers widely separated, an attribute within *Psaltoda* shared only with *antennetta* and *brachypennis*. *Psaltoda maccallumi* is unique among *Psaltoda* species in having a pair of subapical appendages on the theca of the aedeagus (Figs 10, 11).

Description

Male (Figs 3, 10, 11). Similar to *P. antennetta* n.sp. but differs as follows.

Head with lorum partly black; rostrum reaching to bases of hind coxae, labium entirely black or nearly so; antennae of typical form, i.e. bristle-like.

Pronotum with lateral fissures lacking black or black just discernible; black edging extending along entire posterior transverse fissure.

Wings. Fore wing infuscation at bases of apical cells 2 and 3 usually distinct but never bold.

Legs with the black on fore and mid tibiae and tarsi always intense. Meracantha black basally with pale yellowish spine.

Opercula triangular, lateral margin straight, hind margin weakly curved, lateral angle broadly rounded; overlapping; glossy; yellowish mid brown, edged black along lateral margin.

Abdomen with black markings tending to be more extensive than on *P. antennetta*; black edging to sternite III continued on sternite II.

Genitalia (Figs 10, 11). Thickening of lower rim of pygofer considerable, more than twice thickness of remainder. Pygofer basal lobe not lying tight against upper lobe; upper lobe very rounded in lateral view. Uncus with distal expansion occupying about one third the length of uncal median lobe; distal margin of uncal median lobe in dorsal view broadly V-shaped at just under a right angle, in lateral view near straight along dorsal midline and with ventral distal expansion not markedly bulging (compare Figs 10 and 12). Aedeagus similar to that of all other *Psaltoda* species except for a pair of small, fleshy, spine-like appendages, one each side subapically on the theca.

Female (Fig. 4). Similar to female of *P. antennetta* but differing as for male above. Abdominal segment 9 lacking a black ventral margin.

Measurements. n = 2♂, 4♀ (includes all available specimens). *Body length*: male 33.9–37.5 (35.7); female (including ovipositor) 25.5–28.1 (27.0). *Fore wing length*: male 42.3–43.0 (42.7); female 39.6–43.7 (42.0). *Head width*: male 13.1–13.5 (13.3); female 13.1–14.0 (13.4). *Pronotum width*: male 12.0–12.4 (12.2); female 12.0–13.8 (12.5).

Distribution and habitat (Fig. 14). Known only from the rainforests near Mt Lewis and Mt Spurgeon on the Carbine Tableland, west of Mossman, northeastern Queensland. Adults have been taken during November and December. The species is rarely encountered because adults inhabit rainforest treetops and appear not to be readily attracted to light.

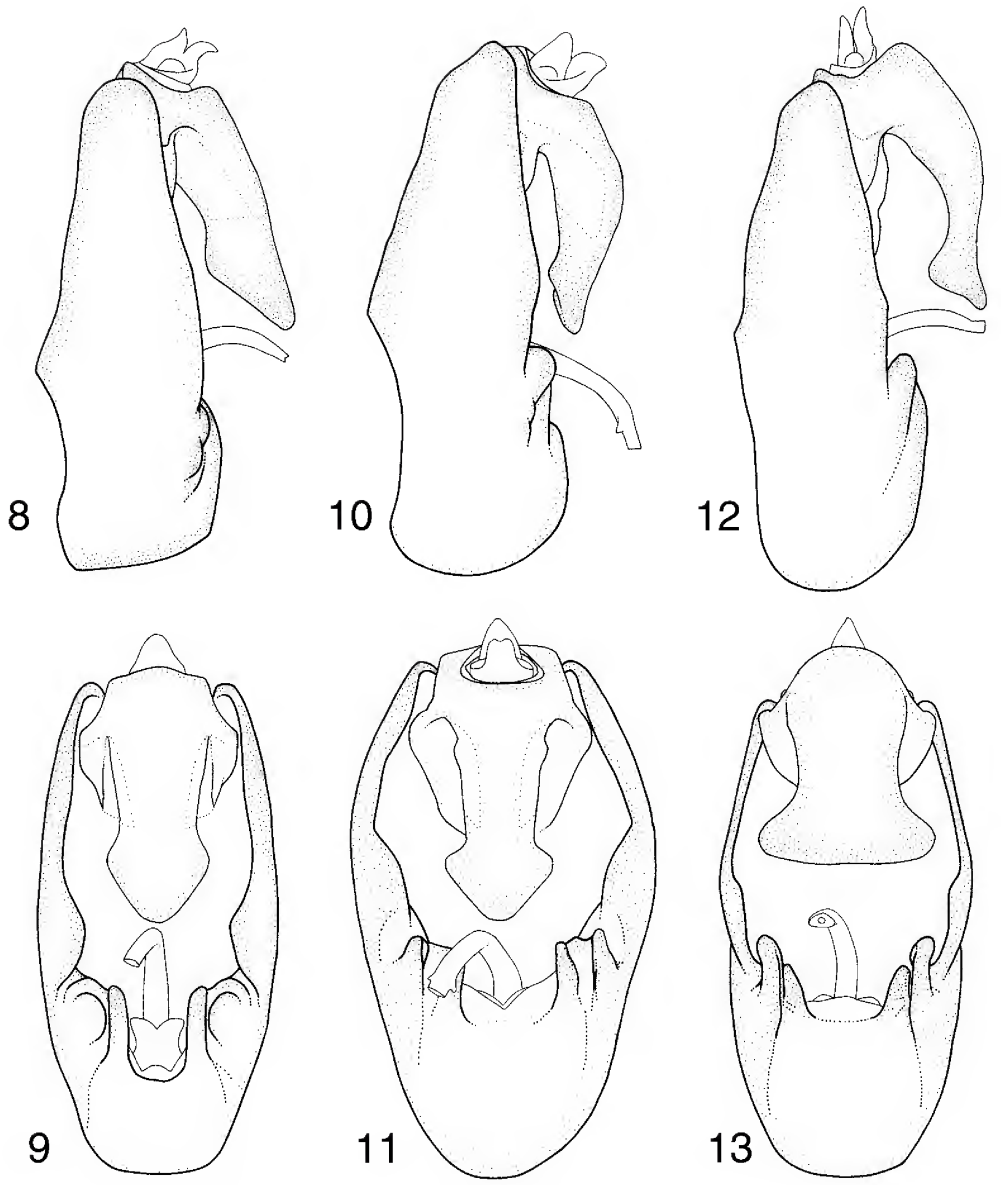
Etymology. Named after the late Mungo MacCallum III, whose enthusiasm for cicadas was at times evident in his outstanding career as a creative writer and radio and television producer.

Psaltoda mossi n.sp.

Figs 5, 6, 12, 13, 14

Psaltoda sp.–A. Ewart (1988), pp. 184–185 (A. Ewart, pers. comm.).

Type material. HOLOTYPE ♂, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 28.i.1991, E.E. Adams, K 173142 (**AM**). PARATYPES as follows: QUEENSLAND (southern): 3♂, 3♀, Lake Broadwater, 30 km SW [of] Dalby, on *Angophora*, 27°23'S 151°06'E, 18.xii.1987, A. Ewart; 2♀, Dunmore, 15.xii.1987, A. Hiller; 1♂, 1♀, Auburn-Lithgow Rd. jct. nr. Chinchilla, 9.i.[19]94; 6♀, Barakula SF, nr Chinchilla, virgin brigalow, 36°14.42'S 150°48.86'E, 15.xii.1997 [A.] Ewart; 2♀, Hurdle Gully, 13.3 km WNW [of] Monto, 390 m, 24°55'S 150°59'E, 20.xii.1997, mv lamp, Burwell, Evans, Ewart; 6♂, 12♀, The Amphitheatre, NW Robinson NP, vine scrub, 25°12.67'S 148°59.25'E, 19.xii.1997, [A.] Ewart (**AE**). 1♂, 1♀, 3 km E of Mourangee Hsd, nr Edungalba, 28.xi.1987, 28.i.1991; EA; 1♂, 1♀, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 28.i.1991, EA; 1♂, Goodnight Scrub NP nr Tea Tree Lane, 40 km WSW Childers, Araucarian vine scrub, at light, 28–29.x.1999, G. Williams (**AM**). 2♂, 2♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM (**DE**). 1♂, 2♀, Middle Percy I., Northumberland Group, Gt. B. Rf. Marine Park, 10.xi.1983, JM; 2♂, Lotus Creek, 100 km NW Marlborough 2.ii.72, J. Moss; 8♂, 1♀, Rossmoya, 35 km N Rockhampton, 3.xii.1981, JM; 5♂, 5♀, Blackdown Tableland (below escarpment), 13–20.xii.1985, JM & A. Ewart; 1♂, 1♀, Olsen Caves, 20 km N Rockhampton, 20.xii.1985, JM; 1♂, Carnarvon Gorge, 8–12.xii.1985, JM & A. Ewart; 10♂, 21♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM; 3♂, 1♀, Pine Creek, c. 20 km S Bundaberg, 18.xi,4.xii.1975, JM; 4♂, 3 km S of Lowood, SEQ, on *Ac. harpophylla*, 8.i.2000, J.T. Moss and L.W. Popple; 1♂, Chinchilla, (in brigalow), 7–8.xii.1987, JM; 1♂, Lake Broadwater 20 km SW Dalby (in brigalow), 20.xii.1987, JM; 3♀, 24 km NW of Mareeba, 24–25.xi.1981, J. Balderson; 1♂, 6♀, Dunmore via Cecil Plains, 30 km S Dalby, 10–12.i.1992, M. de Baar; 1♀, Leyburn, 50 km SW Toowoomba, ii.1994, K.L. Dunn; 1♂, Kalbar via Boonah, 17–19.xii.1998, JM and L. Popple (**JM**). 1♂, 1♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM; 2♂, 2 km S of Lowood, on *Bursaria spinosa*



Figures 8–13. Male genitalia. 8, *Psaltoda antennetta*, lateral view; 9, same, ventral view. 10, *Psaltoda maccallumi*, lateral view; 11, same, ventral view. 12, *Psaltoda mossi*, lateral view; 13, same, ventral view.

(adjacent vine scrub), 14.xii.1998, L.W. Popple; 3♂, 3 km S of Lowood, on *Ac. harpophylla* (brigalow), 8.i.2000, L.W. Popple and J.T. Moss (**LWP**). 1♂, 1♀, Mt Sylvia, [S of Gatton], 25.i.1994, M. Coombs; 1♂, 1♀, 10 km S of Mt Sylvia, 5.i.1994, M. Coombs; 1♂, 1♀, Lenthall's Scrub, 22 km NW Maryborough, dry vine forest, 2.i.1990, JM (**MC**). 1♂, Mt White, Coen, 10.i.1964, M.S. Moulds; 2♂, Irvinebank, W of Herberton, 2,9.i.1983, G. Wood; 3♂, 1♀, Forty Mile Scrub, 65 km SW of Mt Garnet, 19.xii.1974, M.S. Moulds, 1♀, same locality, 19.xi.1974, WH; 1♂, same locality, 6.i.1982, G. Wood, 1♀, same locality, 16.i.1980, A. Hiller, 2♀, 29.xii.1985, 16.i.1986, S. Lamond, 2♂, 2♀, malaise trap, 22.xi–4.xii, 4–21.xii.1985, Storey & Heiner; 1♂, Halftide Beach, via Mackay, 27.ii.1973, J. Frost; 1♂, 5♀, Yeppoon 28.i.1983, 15.i.1989, R. Eastwood; 1♀, Yeppoon, 25.xii.1972, Andrew Atkins; 1♀, Mt Etna, near Rockhampton, 7.xii.1980, MBM; 1♀, Edungalba, nr Duaringa, 22.i.1982, MBM; 1♂, 8 miles W of Edungalba, 23.xii.1972 M.S. Moulds; 2♂, 3♀ "Mourangee" nr Edungalba, 14.xii.1983, EA; 7♂, 6♀ "Mourangee" near Edungalba, in soft wood scrub, 14.xi.1987, EA; 7♂, 3♀ 3 km N of Mourangee nr Edungalba, in dry vine scrub, 9,28.xi.1987, EA; 1♂, 5 km N of Mourangee Hsd, nr Edungalba, near scrub, 15.xi.1987, EA; 1♂, 6 km N of Mourangee Hsd, nr Edungalba, 25.x.1986, EA; 2♂, 1♀, 2.5 km E of "Mourangee" Hsd, nr Edungalba, 19.xii.1986, 31.xi.1987, EA; 11♂ (1 genitalia prep. Ps2), 8♀, 3 km E of Mourangee Hsd, nr Edungalba, 5.ii.1983, 29.x.1986, 28.xi.1987, EA; 2♂, 3 km E of Mourangee Hsd, nr Edungalba, 9.xi.1987, in dry vine scrub, EA; 3♂, 4♀, 4 km E of Mourangee Hsd, nr Edungalba, 14.xii.1985, EA; 23♂, 18♀, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 19,23,28.i.1991, EA; 5♂, 1♀, Dawson River, 7 km SW of Mourangee Hsd, nr Edungalba, 12.xii.1987, EA; 1♂, 1♀, edge of scrub W of "Mourangee" Hsd, nr Edungalba, 14.xii.1983, EA; 1♂, 1♀, 35 km S of Blackwater, 25.xi.1986, MBM; 7♂ (1 genitalia prep. Ps1), 5♀, 55 km S of Rolleston, 20.xii.1983, MBM; 1♂, 6 km N Taroom, 25°36'S 149°46'E, 8.ii.1991, G. & A. Daniels, C. Burwell; 1♂, Mt.Scoria, Thangool, 21.xi.1987, R. Eastwood; 1♂, 3♀, Mt Scoria, 6 km S Thangool, 24°32'S 150°36'E, 16.i, 5.iii.1991, G. & A. Daniels; 2♂, 1♀, summit, Mt Scoria, 6 km S

Thangool, 24°32'S 150°36'E, 11.ii.1991, G. & A. Daniels, C. Burwell; 1♀, Monto, 18.xii.1979, A. Hiller; 3♂, 1♀, 16 km S of Miles, 19.xii.1987, MBM; 5♂, 1♀, Toowoomba, 14.i.1987, D.A. Lane; 2♂, 9♀, Dunmore State Forest approx. 50 km SW of Dalby, 400 m, 28.i.,15,25.xii.1987, 10.i.1988, A. Hiller; 1♂, Lake Broadwater nr Dalby, 27°21'S 151°06'E, 31.i.1987, G. & A. Daniels; 1♂, 1♀, Weir River, S of Moonie, 22.xii.1989, MBM; 6♂, 18♀, 5 km N Leyburn, 27°58'S 151°38'E, MV lamp, 25.xii.1987, G. & A. Daniels (**MSM**). 11♂, 17♀, Expedition Range NP, "Amphitheatre", 25°13'S 148°59'E, vinescrub, 520 m, 18.xii.1997, mv lamp, Evans, Burwell, Ewart; 7♂, 10♀, Hurdle Gully, 13.3 km WSW of Monto, 24°55'S 150°59'E, 390 m, 20.xii.1987, mv lamp, Burwell, Evans, Ewart; 1♀, Nangur SF, 2nd site, 26°08'S 151°59'E 24.xi.1995–3.ii.1996, rainforest, 320 m, intercept trap, G. Monteith (**QM**). 1♀, Mt Moffat summit, Mt Moffat NP, 15.xii.1987, D.K. Yeates; 1♂, Theodore, 3.ii.1952, J. Letchford; 1♂, Pittsworth, 2.ii.1959; 1♂, Toowoomba, 8.ii.1920, J.A. Beck (**UQIC**). NEW SOUTH WALES: 1♂, 2♀, Yanco, 22.xii.1975 E.L. Jones (**ASCU**). 2♂, 1♀, Warrumbungle National Park, 6.i.1990, JM (**JM**). 1♂, 1♀, Gravesend Mtn, Gravesend, 24.xi.1998, M. Coombs; 1♂, 1♀, Warrumbungle NP, 23.xii.1998, S.L. Winterton; 1♂, 3♀, Moonbi Lookout, Moonbi, 28.xii.1992, M. Coombs; 4♂, Tamworth, 28.xii.1992, M. Coombs (**MC**). 1♂, Yetman, 17.xii.1983, MBM; 2♀, Cocoparra NP, 30 km NE Griffith, 29.xii.1986, M.F. Braby (**MSM**).

Distinguishing characters. Distinguished from other *Psaltoda* species that possess a dominantly black abdomen above (except *P. plaga*) by lacking infuscation around the apices of the hind wings, but possessing fore wing infuscations. Differs from dark individuals of *P. plaga* as stated in couplet 11 of the key to species.

Description

Male (Figs 5, 12, 13). *Head*. Dominated by black markings, otherwise mid brown or partly green; vertex with a broad black fascia between eyes, centrally the black reaching to postclypeus and posterior margin of head, sometimes entirely black on posterior half of vertex except for small brown posterior spot on midline; supra-antennal plates black or partly so, the black sometimes extending to black bar adjoining eyes; eyes encircled black; ventrally with a broad black fascia from eye to antennal socket, sometimes entirely black. Postclypeus very prominent, in dorsal view nearly always protruding beyond the alignment of vertex; glossy; yellowish light brown, black dorsally across base, transverse ridges black becoming less so or unmarked towards anteclypeus and the black never reaching midline, midline marked by a narrow black fascia partly ill-defined on some individuals. Anteclypeus glossy, yellowish brown with a broad, black lateral fascia reaching distal end of anteclypeus. Rostrum with mentum yellowish brown, dark brown or blackish, labium black; reaching to near apices of hind coxae. Antennae black. Head below excluding postclypeus, extensively covered by dense silvery pubescence.

Thorax. Above dominated by black markings, otherwise mid brown or partly green, probably all green or nearly so on live specimens. Pronotum with pronotal collar mid brown to green, edged black to varying degrees; median, lateral and transverse fissures black; a paramedian pair of black fascia between anterior margin and pronotal collar, but not always abutting anterior margin; the black markings anterior to pronotal collar sometimes expanded to cover much of the pronotal surface. Mesonotum with lateral and submedian sigilla usually completely marked black, sometimes the black extending beyond to encompass majority of mesonotum; midline with a black fascia from anterior margin to cruciform elevation, narrowly tapering and pointed anteriorly, abruptly expanded posteriorly between anterior arms of cruciform elevation; wing grooves black; cruciform elevation usually unmarked but sometimes anterior arms are black or partly so. Below yellowish light brown, a little black of varying extent but mostly near leg bases, basisternum 2 where covered by fore legs always jet black, lobe of anepimeron 2 always jet black; substantially covered by dense silvery pubescence.

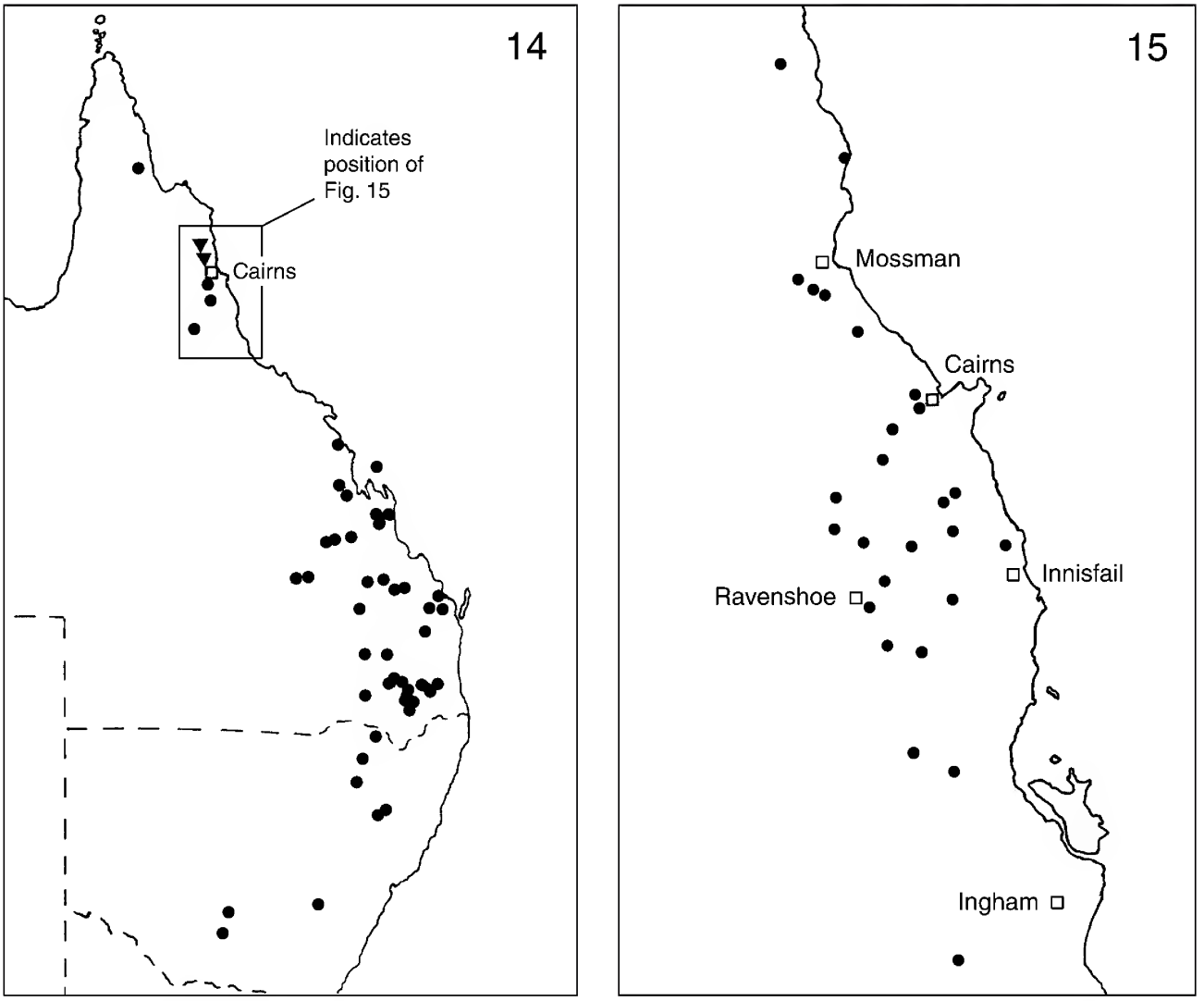
Wings. Hyaline, sometimes with a very faint smoky tint through apical cells. Fore wing venation brown or black, some individuals with costa to node green and sometimes green on stem of vein M, CuA and CuP+1A, costa always black or nearly so distal of node, 2A+3A edged black adjacent to basal membrane; veins forming bases of apical cells 2 and 3 weakly infuscated; sometimes also the faintest hint of infuscation along ambient vein plus longitudinal veins of apical cells 1–8; basal cell translucent brown or green, darkest on anterior half; basal membrane black. Hind wing venation brown, sometimes green on basal half; plaga on 3A black, not quite reaching to distal end; plaga on 2A black, sometimes very narrow, reaching full length.

Legs. Glossy, yellowish light brown. Fore legs with femoral primary spine lying flat, secondary spine small; coxa sometimes with a pair of black fascia along length; femur usually with a single black fascia along length; tibia, tarsus and pretarsal claws always black. Mid leg coxa usually with a basal outer black spot; femur usually with a single black fascia along length; tibia, tarsus and pretarsal claws black except for a small pale streak near proximal end of tibia. Hind coxa usually with a basal outer black spot; distal end of tibia, tarsus and pretarsal claws usually tinted brown. Meracanthus black basally, spine yellowish light brown but sometimes partly black.

Opercula. Lateral and hind margins almost straight, lateral angle broadly rounded; overlapping; lateral margin strongly up-turned; convex; yellowish light brown, but usually with black in the vicinity of meracanthus and at far basal lateral corner.

Abdomen. Tergites tending glossy; jet black with much of the lower half of tergite 3 golden brown, the golden brown rounded across its dorsal extent and usually not quite reaching distal margin of tergite above auditory capsule and on fresh specimens covered by fine silver pubescence; on some specimens some tergites narrowly edged brown on posterior margins to varying extent; reflexed lateral margin of tergites 4–8 golden brown. Tymbal covers tightly aligned with operculum margin; smoky brown to black. Sternites glossy; golden brown, their anterior margins black to varying extent, sternite II mostly black except extreme lateral corners. Spiracles white.

Genitalia (Figs 12, 13). Thickening of lower rim of pygofer very minimal, only slightly greater than remainder. Pygofer basal lobe lying tight against upper lobe; upper lobe extending well beyond height of basal lobe, U-shaped in outline in lateral view. Uncus with distal expansion occupying about one third or less the length of uncal median lobe; distal margin of uncal median lobe not V-shaped but broadly curved; in lateral view curved in an arc along dorsal



Figures 14–15. Distribution of *Psaltoda* species. 14, *Psaltoda maccallumi*, ▼; *Psaltoda mossi*, ●. 15, *Psaltoda antennetta*.

midline with the distal expansion strongly bulging and forming a somewhat trumpet-shaped end to the uncal lobe. Aedeagus similar to that of other *Psaltoda* species.

Female (Fig. 6). Similar to male. Abdominal segment 9 black across entire dorsal surface including caudal spine, otherwise golden brown; oviposition sheath black, terminating before apex of caudal spine.

Measurements. n = 10♂, 10♀ (includes largest and smallest of available specimens). *Body length*: male 26.2–31.7 (29.4); female 20.4–28.4 (23.6). *Fore wing length*: male 32.0–37.6 (34.8); female 30.3–39.4 (34.2). *Head width*: male 11.0–12.9 (11.7); female 10.0–13.0 (11.6). *Pronotum width*: male 9.7–11.3 (10.5); female 8.9–11.9 (10.3).

Distribution and habitat (Fig. 14). Eastern Queensland south from Coen, inland northeastern NSW from near Yetman, Gravesend, the Warrumbungle Ranges and near Tamworth, and also from the Griffith district of inland southern NSW. Adults have been taken from late October to late February but most records are for December. It mostly occurs in softwood scrub and dry vine thickets and there is a loose association with Brigalow Belt vegetation including *Callitris* woodland.

Etymology. Named after Dr John Moss, who collected one of the first specimens and recognised its uniqueness. His enthusiasm for collecting and studying cicadas has contributed enormously to our knowledge and understanding of Australian species. His willingness to encourage others and share information is unending.

Phylogenetic relationships

Psaltoda antennetta and *P. maccallumi* share some attributes that support a sister-group relationship. The male abdomen is minimally rounded along the dorsal midline and the primary spine of the fore leg femur is erect, small and peg-like. As well, the male opercula fall well short of the tymbal covers leaving a wide parallel-sided gap. *Psaltoda*

brachypennis is the only other *Psaltoda* species to possess such a gap but in that species the opercula and tymbal covers converge anteriorly so that the bases of the opercula meet or almost meet the anterior margin of the tymbal covers; like *P. antennetta* and *P. maccallumi* this species also has an erect primary spine on the fore leg femur but it is much larger. Further, the male genitalia of *P. antennetta* and *P. maccallumi* have an uncus that in dorsal view is somewhat arrow-head shaped with straight converging sides angled at less than 90° and meeting to form a rounded apex (compare Figs 9 and 11 with Fig. 13).

The sister species of *P. mossi* is less clear and may best be resolved by a phylogenetic analysis of all species of *Psaltoda* and allied genera, a project beyond the scope of this paper. Colour and markings, wing infuscations and male genitalia suggest affiliation with *P. plaga* (Walker). However, the angular head with its protruding postclypeus and the marked ventral development of abdominal tergite 3 clearly differ from *P. plaga* and most other *Psaltoda* species. These attributes do occur, however, in *P. flavescens* Distant and compatibility with most other attributes suggests *P. mossi* and *P. flavescens* may be sister species. Similar attributes are found in *Neopsaltoda crassa* Distant also, which suggests a sister group relationship between this taxon and *P. mossi/P. flavescens*. The colour and markings of *P. mossi* also are remarkably similar to those of *N. crassa* as is the structure of the male genitalia. The notable differences between *N. crassa* and *P. mossi/P. flavescens* include the exceedingly large abdominal tergites 2 and 3 of *N. crassa* and the erect femoral primary spines of *N. crassa* as opposed to the prostrate primary spines of *P. mossi* and *P. flavescens*.

ACKNOWLEDGMENTS. I am grateful to the many friends and colleagues mentioned in the type lists who have collected specimens for me over many years; without their dedication and generosity the available material of these species would be considerably less. For the line drawings I sincerely thank Sally Beech. The photographs of adults were kindly taken by Stewart Humphreys and the SEMs of antennae by Sue Lindsey. I am also grateful to Marc Coombs, Tony Ewart, Margaret Humphrey and John Moss for constructive criticism.

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The Lysianassoid Amphipod Genera *Lepidepecreoides* and *Lepidepecreum* in Southern Waters (Crustacea: Lysianassidae: Tryphosinae)

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ABSTRACT. This paper reports on the first records of the lysianassid amphipod genera *Lepidepecreoides* and *Lepidepecreum* from Australia and Chile. In *Lepidepecreoides* two new species are described from Australian waters, one new species is described from Chilean waters, a new species is designated for the record (Griffiths, 1977) of *L. nubifer* J.L. Barnard, 1971 from the Cape Basin off southern Africa and the distribution of *L. xenopus* K.H. Barnard, 1931 in Antarctic waters is extended. A key to all species of *Lepidepecreoides* is presented. In *Lepidepecreum* five new species are described from Australian waters and the distributions of three species, *L. foraminiferum* Stebbing, 1888, *L. infissum* Andres, 1983 and *L. urometacarinatum* Andres, 1983, are extended within Antarctic waters.

LOWRY, J.K., & H.E. STODDART, 2002. The lysianassoid amphipod genera *Lepidepecreoides* and *Lepidepecreum* in southern waters (Crustacea: Lysianassidae: Tryphosinae). *Records of the Australian Museum* 54(3): 335–364.

Only two species are currently known in the tryphosine genus *Lepidepecreoides*: *L. nubifer* J.L. Barnard, 1971, from the northeastern Pacific Ocean off the coast of Oregon and *L. xenopus* K.H. Barnard, 1931, from the Southern Ocean near South Georgia and the western side of the Antarctic Peninsula. Griffiths (1977) reported *L. nubifer* from the Cape Basin off southern Africa, but examination of his illustrations indicates a new species. Examination of collections made by the Lund University Chile Expedition (LUCE) (see Brattström & Dahl, 1951) revealed a new species from southern Chile and examination of recent collections made in Australian waters by the Australian Museum and Museum Victoria indicated another two species living on the continental slope and bathyal plains off eastern Australia. Finally, examination of recent collections made in the Southern Ocean showed that the distribution of *L. xenopus* is more extensive than previously reported. All of this material is reported on here and a new key to the species of the genus is presented.

Barnard & Karaman (1991) reported 28 species in the tryphosine genus *Lepidepecreum*. But within their list *L. annulatum* (Bate, 1862) and *L. filiger* (Stimpson, 1864) are unidentifiable species; *L. nudum* Imbach, 1967 has been transferred to *Waldeckia* by Lowry, 2000; and *L. cingulatum* K.H. Barnard, 1932 is probably a species of *Orchomenella*. Lowry & Stoddart (2002) have re-diagnosed *Lepidepecreum*, described four new species (two from the eastern Andaman Sea and two from Japanese waters) and transferred *L. magdalenensis* (Shoemaker, 1942) and *L. lukini* (Budnikova, 1999) from *Orchomenella* to *Lepidepecreum*. One species, *Lepidepecreum californiensis* Vinogradov, 1994, was omitted from the list of species given by Lowry & Stoddart (2002).

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Lepidepecreum has not previously been reported from Australian waters. Examination of collections made in southeastern and northwestern Australia by Museum Victoria revealed five new species. Examination of recent collections from the Southern Ocean showed more extensive distributions for *L. foraminiferum* Stebbing, 1888, *L. infissum* Andres, 1983 and *L. urometacarinatum* Andres, 1983, than were previously known. The description of the five new species here brings the total number of species in *Lepidepecreum* to 37.

Species of *Lepidepecreum* are easily recognizable because of their diamond-shaped bodies. Although species have been reported many times from most parts of the world virtually nothing is known about their behaviour. *Lepidepecreum* is related to genera such as *Orchomenella*, for which many species are known as demersal scavengers, but species of *Lepidepecreum* have never been reported from traps and are not considered to be scavengers. They have never been reported in association with other invertebrates.

Of the five species of *Lepidepecreum* known from Australian waters, four come from a small area of the continental slope off southeastern Australia. Although there is only a small amount of material known, these four species show a clear partitioning by depth: *L. flindersi* has been recorded from 120–400 m, *L. freycineti* from 600–800 m, *L. tourville* from 996–1850 m and *L. baudini* from 1840–2500 m depth.

In this paper we use the terminology introduced by Poore & Lowry (1997) to describe the angle of the gnathopodal palms: "a palm that is close to perpendicular to the longitudinal axis of the propodus is referred to as transverse; a palm in which the angle is less than 90° is referred to as acute; and a palm of more than 90° is referred to as obtuse".

Material used in this study is lodged in the Australian Museum, Sydney (AM); Museum Victoria, Melbourne, Australia (NMV); the South African Museum, Cape Town (SAM); the Swedish Museum of Natural History, Stockholm (SMNH); and the United States Museum of Natural History, Washington, D.C. (USNM). The following abbreviations are used on the plates: A, antenna; E, epistome and upper lip; EP, epimeron; G, gnathopod; H, head; MD, mandible; MP, maxilliped; MX, maxilla; P, pereopod; T, telson; U, uropod; UR, urosomite; l, left; r, right.

The descriptions are generated from a DELTA (Dallwitz *et al.*, 1993, 1998) database of world tryphosine and uristid species. They are a compilation of all character variations which we recognise in these groups. Characters in *italic* text refer to the unique combination of characters which will diagnose each species against all others.

Implicit characters. To shorten the descriptions, and avoid repetition of commonly occurring character states, the following states are implicit throughout these descriptions, unless indicated otherwise or where the characters concerned are inapplicable.

Body not expanded to form a lateral bulge; without dorsal carina. Antenna 1 accessory flagellum not forming cap, terminal article not offset; calceoli small. Antenna 2 peduncular article 3 short; articles 3 to 5 not enlarged. Maxilliped basis without recurved hook. Pereonite 1 dorsally smooth. Gnathopod 1 without setal patch on merus and propodus; propodus small, sparsely setose along posterior margin, palm entire, straight. Pereonites 1–7 dorsally smooth. Pereopod 4 coxa without distinct lateral ridge. Pereopod 5 coxa without umbo; basis without photophore, not posteroproximally excavate, posterior margin not serrate, without mid-central spine. Pleonite 3 posterodorsal margin not produced. Urosomite 1 not projecting over urosomite 2. Uropods 1 and 2 rami without stout striated robust setae. Uropod 2 inner ramus without constriction. Uropod 3 peduncle without dorsolateral flange; inner and outer rami well developed.

Lepidepecreoides K.H. Barnard

Lepidepecreoides K.H. Barnard, 1931: 426.–K.H. Barnard, 1932: 62.–J.L. Barnard, 1969: 347.–J.L. Barnard, 1971: 40.–Barnard & Karaman, 1991: 495.

Diagnosis. Antenna 1 accessory flagellum 2-articulate, terminal article small, offset. Antenna 2 peduncular article 3 short. Gnathopod 1 carpus long (length 2 to 3.9 × breadth). Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereopod 5 basis, posterior margin with mid-central spine.

Remarks. Originally K.H. Barnard (1931) considered the size of coxa 5 and the placement of the mandibular palp to be important defining characters for the genus. We have not found these characters to be informative. A character not previously considered is the length of peduncular article 3 on antenna 2. The elongate form of peduncular article 3 is a strong synapomorphy for the genus *Lepidepecreum*. Species of *Lepidepecreoides* have a short article 3, distinguishing them from species of *Lepidepecreum*. The elongate carpus of gnathopod 1 also appears to be a significant synapomorphy for some genera within the tryphosine group, a character *Lepidepecreoides* shares with *Lepidepecreum, Tryphosella* and *Tryphosoides*. Two apparent synapomorphies shared by *Lepidepecreoides* and *Tryphosoides* are the peculiar offset terminal article on the accessory flagellum and the loss of a well-developed posteroventral lobe on coxa 4. Only species of *Lepidepecreoides* have a mid-central spine on the basis of pereopod 5.

Key to species of *Lepidepecreoides*

1 Pleonite 3 produced dorsodistally 2
—— Pleonite 3 not produced dorsodistally 4

2 Gnathopod 1 subchelate 3
—— Gnathopod 1 simple ..... *L. chincui*

3 Pereopod 5 basis with rounded posteroventral lobe. Telson with apical robust setae ..... *L. xenopus*
—— Pereopod 5 basis with wedge-shaped posteroventral lobe. Telson without apical robust setae ..... *L. bassi*

4 Telson with apical robust setae 5
—— Telson without apical robust setae ..... *L. talboti*

5 Gnathopod 1 palm acute. Coxa 5 without lateral ridge. Urosomite 1 produced dorsally into a recurved spine ..... *L. nubifer*
—— Gnathopod 1 palm slightly acute. Coxa 5 with distinct lateral ridge. Urosomite 1 produced dorsally into a broad upright triangle ..... *L. torresi*

Lepidepecreoides bassi n.sp.

Figs. 1–3

Type material. HOLOTYPE, sex not known, 10.0 mm, NMV J47713; 1 PARATYPE, sex not known, AM P57732; 76 km S of Point Hicks, Victoria, Australia, 38°29.33'S 149°19.98'E, 1840 m, sandy mud, fine shell, WHOI epibenthic sled, G.C.B. Poore *et al.*, 26 October 1988, RV *Franklin*, stn SLOPE 69.

Type locality. 76 km S of Point Hicks, Victoria, Australia, 38°29.33'S 149°19.98'E, 1840 m depth.

Description. Based on holotype, sex not known, 10.0 mm. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. *Antenna 1 peduncular articles 1 and 2 without anterodistal lobe*; accessory flagellum 2-articulate, with small terminal article offset; flagellum with strong 2-field callynophore; robust setae present on proximal articles; calceoli absent. Antenna 2 flagellum short; calceoli absent. Epistome/upper lip with epistome less produced than upper lip, straight; upper lip slightly produced, straight. *Mandible* molar columnar with oval, fully triturating surface; *palp attached distally*, article 3 with proximal A3-seta. Maxilla 1 outer plate with left and right setal-tooth 7 symmetrical, cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 2 (one long and slender, one short and broad) apical robust setae.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis without setae along anterior margin*; ischium short; carpus

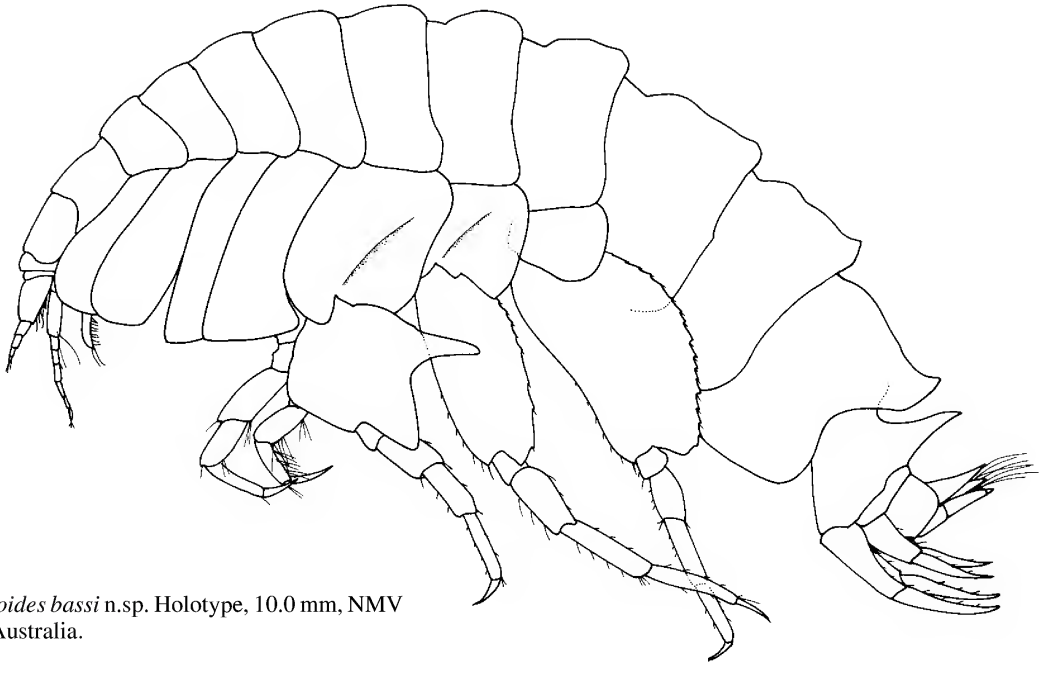

Figure 1. *Lepidepecreoides bassi* n.sp. Holotype, 10.0 mm, NMV J47713, Point Hicks, Australia.

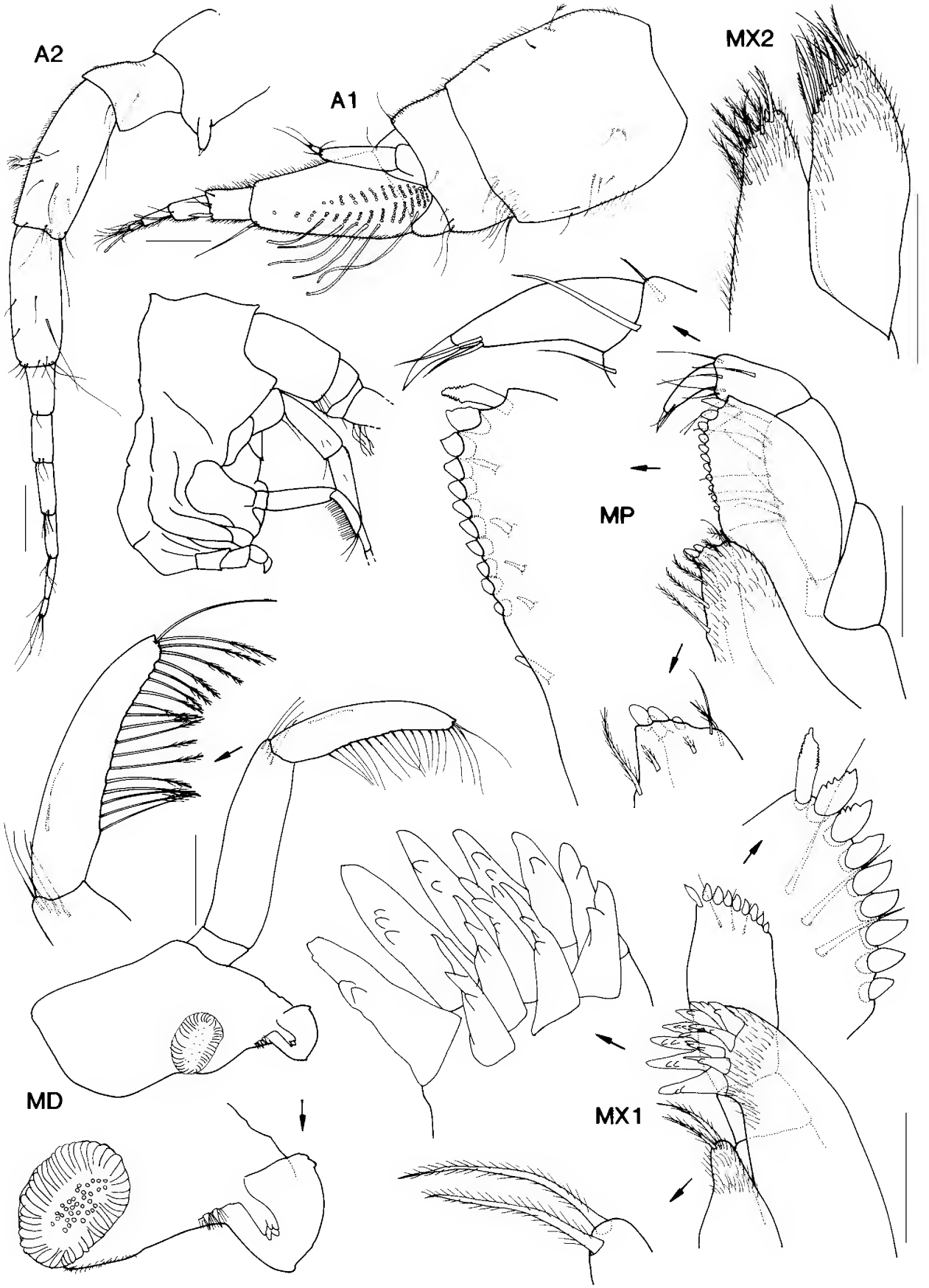

Figure 2. *Lepidepecreoides bassi* n.sp. Holotype, 10.0 mm, NMV J47713, Point Hicks, Australia. Scales represent 0.2 mm.

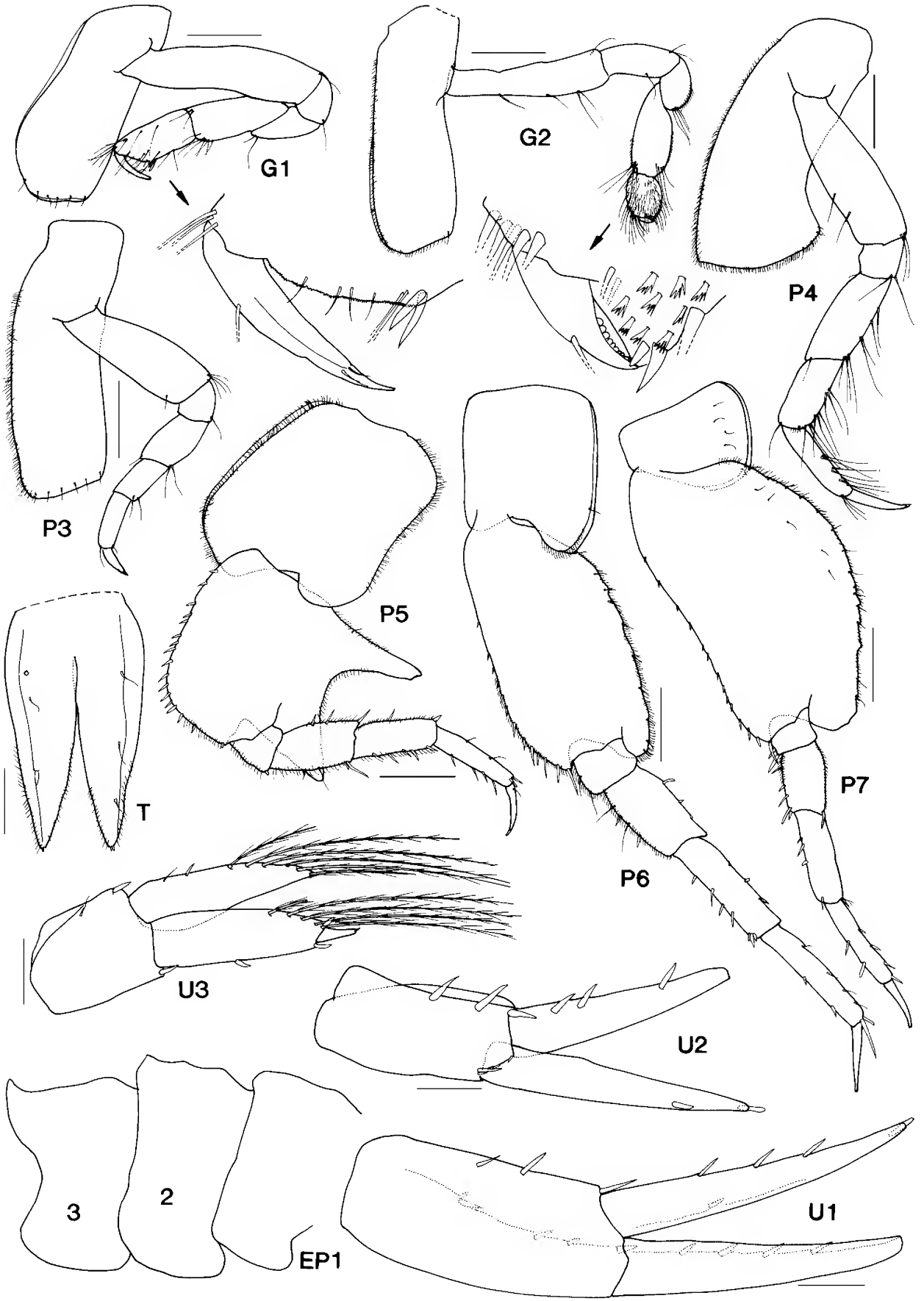

Figure 3. *Lepidepecreoides bassi* n.sp. Holotype, 10.0 mm, NMV J47713, Point Hicks, Australia. Scales for U1–3, T represent 0.2 mm, remainder represent 0.5 mm.

long (2.6 × breadth), longer than propodus, without posterior lobe; *propodus* small, margins subparallel, *palm acute*. Pereonite 2 with mid-dorsal carina. Gnathopod 2 palm slightly obtuse. Pereonite 3 with mid-dorsal carina. Pereonite 4 with mid-dorsal carina. Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereonite 5 with mid-dorsal carina. *Pereopod 5* coxa with distinct lateral ridge; *basis* about as long as broad, posterior margin with mid-central spine, *with well-developed wedge-shaped posteroventral lobe*. Pereonite 6 with mid-dorsal carina. Pereonite 7 with mid-dorsal carina. Pereopod 7 basis posterodistally produced, not reaching merus, not posterodistally excavate.

Pleonite 1 with mid-dorsal carina. Pleonite 2 with mid-dorsal carina. *Pleonite 3 with mid-dorsal carina, dorsodistally produced, apically acute, posterodorsal margin produced*. Epimeron 3 posterior margin smooth, posteroventral corner broadly rounded. Urosomite 1 with deep notch and a narrow vertically produced acute spine. Uropod 3 outer ramus article 2 short; with plumose setae on each ramus. *Telson* deeply cleft, with dorsal robust setae, *without apical robust setae*.

Etymology. Named after George Bass who, in December 1798 with Matthew Flinders in the sloop *Norfolk*, circumnavigated Van Diemans Land, so proving the existence of the strait, which now bears his name, between mainland Australia and Tasmania.

Remarks. *Lepidepecreoides bassi* is most similar to *L. xenopus* but is distinguished by the lack of anterodistal lobes on antenna 1 peduncle, the wedge-shaped posteroventral spine on pereopod 5 basis, the apically acute projection on pleonite 3 and the absence of apical robust setae on the telson.

Distribution. Bass Strait, Australia; 1840 m depth.

Lepidepecreoides chincui n.sp.

Figs. 4–6

Type material. HOLOTYPE, female, 5.8 mm, non-ovigerous with long setose oostegites, SMNH 5250; 1 PARATYPE, juvenile, 3.5 mm, SMNH 5251; Bahía Chincuí, Seno Reloneavi, southern Chile, eastern South Pacific Ocean, 41°32'00"S 73°01'30"W, 70–80 m, fine soft grey sand with small stones, 16 July 1949, LUCE stn M145A. —1 PARATYPE, 4.0 mm, AM P57733, Piedra Azul, NW of Punta Quillaipe, Seno Reloneavi, southern Chile, eastern South Pacific Ocean, 41°31'30"S 72°48'15"W, 30 m, hard grey coarse sand, 14 December 1948, LUCE stn M16E.

Type locality. Bahía Chincuí, Seno Reloneavi, southern Chile, eastern South Pacific Ocean, 41°32'00"S 73°01'30"W, 70–80 m depth.

Description. Based on holotype female, 5.8 mm. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. *Antenna 1 peduncular articles 1 and 2 without anterodistal lobe*; accessory flagellum 2-articulate, with terminal article small, offset; flagellum with strong 2-field callynophore; robust setae present on proximal articles; calceoli absent. Antenna 2 flagellum short, calceoli absent. Epistome/upper lip with epistome less produced than upper lip, straight; upper lip produced, rounded apically. *Mandible* molar columnar with oval, fully triturating surface; *palp attached distally*, article 3 with proximal A3-seta. Maxilla 1 outer plate with left and right setal-tooth 7 symmetrical, cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 2 (one long slender, one short broad) apical robust setae.

Gnathopod 1 simple; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis sparsely setose along anterior margin*; ischium short; carpus long (3.0 × breadth), longer than propodus, without posterior

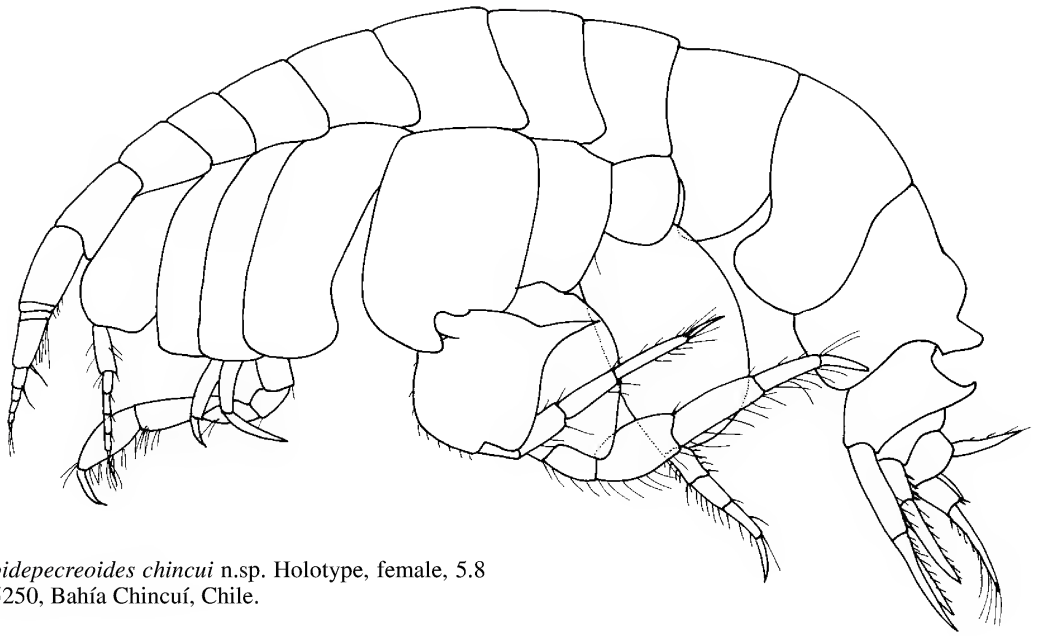

Figure 4. *Lepidepecreoides chincui* n.sp. Holotype, female, 5.8 mm, SMNH 5250, Bahía Chincuí, Chile.

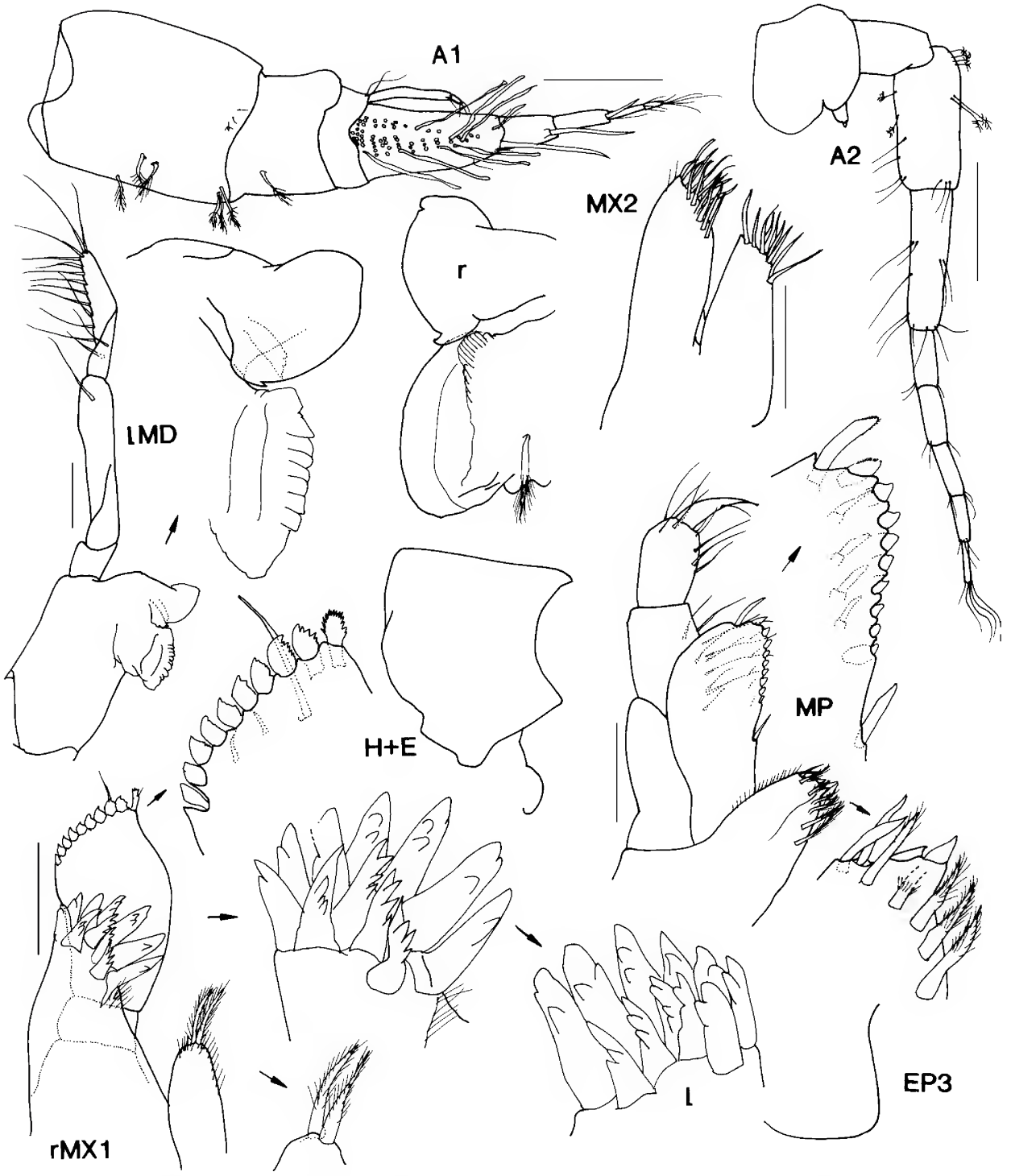

Figure 5. *Lepidepecreoides chincui* n.sp. Holotype, female, 5.8 mm, SMNH 5250, Bahía Chincuí, Chile. Scales represent 0.1 mm.

lobe; *propodus* small, margins subparallel, *palm absent*. Gnathopod 2 palm slightly obtuse. Pereonite 3 dorsally smooth. Pereonite 4 dorsally smooth. Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereonite 5 without mid-dorsal carina. *Pereopod 5* coxa without distinct lateral ridge; basis about as long as broad, posterior margin with mid-central spine, *with well-developed posteroventral lobe*. Pereonite 6 dorsally smooth. Pereonite 7 dorsally smooth. Pereopod 7 basis posterodistally produced, not reaching merus, not posterodistally excavate.

Pleonite 1 dorsally smooth. Pleonite 2 dorsally smooth. *Pleonite 3 with mid-dorsal carina, dorsally rounded, dorsodistally produced, apically rounded, posterodorsal margin produced*. Epimeron 3 posterior margin smooth, posteroventral corner broadly rounded. Urosomite 1 without notch, with a narrow vertically produced recurved acute spine. Uropod 3 outer ramus article 2 short, with plumose setae on each ramus. *Telson* deeply cleft, with dorsal robust setae, *with 1 long apical robust seta on each lobe*.

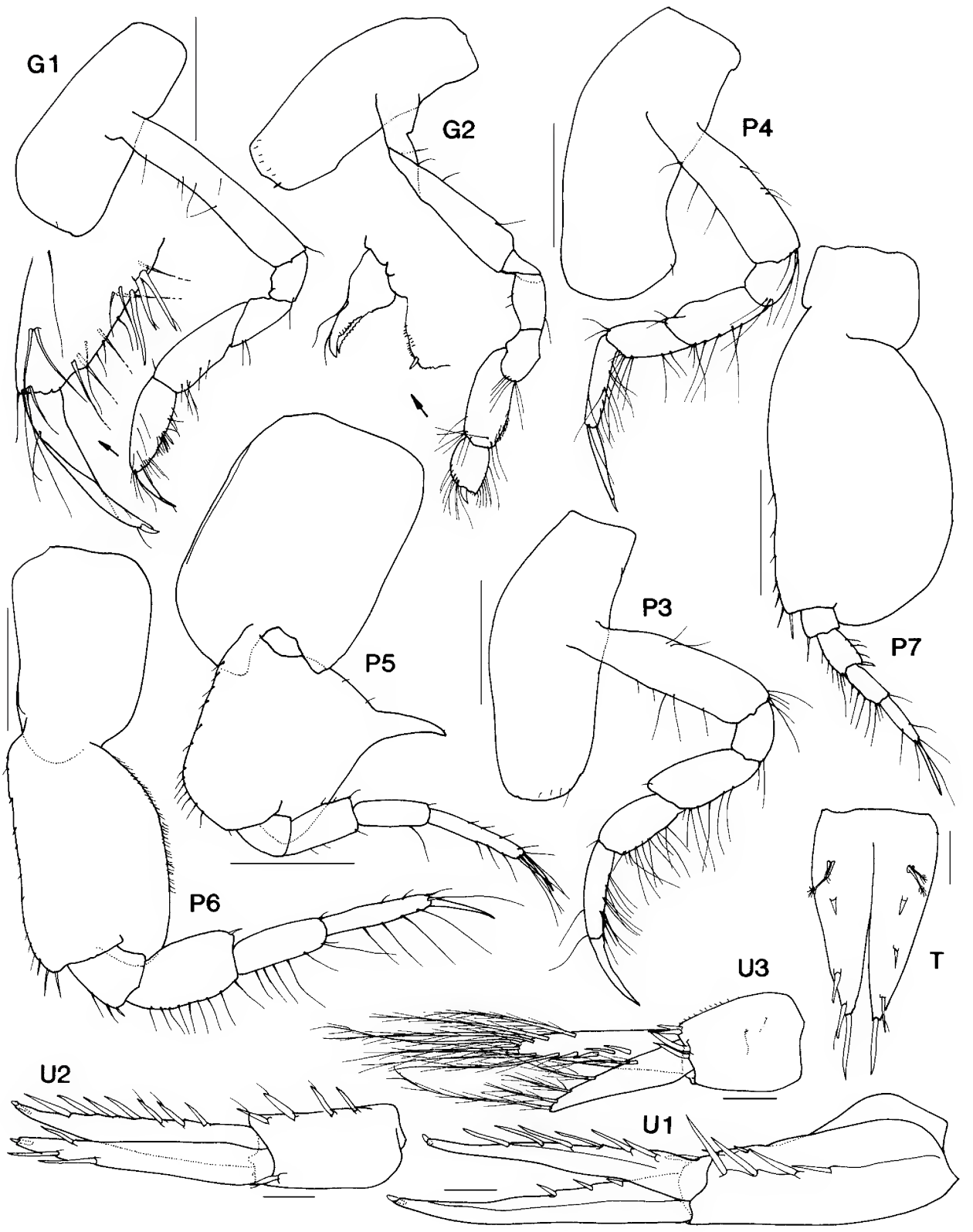

Figure 6. *Lepidepecreoides chincui* n.sp. Holotype, female, 5.8 mm, SMNH 5250, Bahía Chincuí, Chile. Scales for U1–3 represent 0.1 mm, remainder represent 0.5 mm.

Etymology. Named after Bahía Chincuí, the type locality.

Remarks. *Lepidepecreoides chincui* is the only species of *Lepidepecreoides* with a simple gnathopod 1. It is also the only species recorded from less than 100 m depth.

Distribution. Southern Chile, eastern South Pacific Ocean; 30–80 m depth.

Lepidepecreoides nubifer J.L. Barnard

Lepidepecreoides nubifer J.L. Barnard, 1971: 41, figs. 26, 27.–Austin, 1985: 600.–Barnard & Karaman, 1991: 496.
not *Lepidepecreoides nubifer*.–Griffiths, 1977: 98, fig. 4. (= *L. talboti* n.sp.).

Type locality. Off mouth of Columbia River, Oregon, USA, eastern North Pacific Ocean, 44°38.3'N 126°01.0'W, 2860 m depth.

Description. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. Antenna 1 peduncular articles 1 and 2 without anterodistal lobe; accessory flagellum 2-articulate, terminal article small, offset; flagellum with strong 2-field callynophore; calceoli absent. Antenna 2 flagellum short, calceoli absent. Epistome/upper lip with epistome less produced than upper lip, straight; upper lip produced, rounded apically. *Mandible* molar columnar with oval, fully triturating surface; *palp attached distally*, article 3 with proximal A3-seta. Maxilla 1 outer plate with setal-tooth 7 [symmetry not known], cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 1, long, slender apical robust setae.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis moderately setose along anterior margin; ischium short; carpus long (2.5 × breadth), longer than propodus, without posterior lobe; *propodus* small, margins subparallel, *palm acute*, entire, convex. Pereonite 2 dorsally smooth. Gnathopod 2 palm slightly obtuse. Pereonite 3 dorsally smooth. Pereonite 4 dorsally smooth. Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereonite 5 with mid-dorsal carina (slightly developed). *Pereopod 5* coxa without distinct lateral ridge; *basis* about as long as broad, posterior margin with mid-central spine; *with well-developed wedge-shaped posteroventral lobe*. Pereonite 6 with mid-dorsal carina (slightly developed). Pereonite 7 with mid-dorsal carina (slightly developed). Pereopod 7 basis posterodistally produced, not reaching merus, posterodistally excavate.

Pleonite 1 with mid-dorsal carina. Pleonite 2 with mid-dorsal carina. *Pleonite 3 with mid-dorsal carina, not dorsodistally produced, posterodorsal margin produced.* Epimeron 3 posterior margin smooth, posteroventral corner broadly rounded. Urosomite 1 with a narrow vertically produced recurved acute spine. Uropod 3 outer ramus article 2 short, with plumose setae on each ramus. *Telson* deeply cleft, with dorsal robust setae, *with 1–2 apical robust setae on each lobe.*

Distribution. Oregon, USA, eastern North Pacific Ocean; 2860 m depth.

Lepidepecreoides talboti n.sp.

Lepidepecreoides nubifer.–Griffiths, 1977: 98, fig. 4.

Type material. HOLOTYPE, female, 17 mm, SAM A10547, [west of Cape Point, South Africa, southeastern South Atlantic Ocean], 34°36'S 17°00'E, 2740 m, F.H. Talbot, 10 December 1959, RS *Africana II* [material recorded by Griffiths, 1977 as *Lepidepecreoides nubifer*].

Type locality. West of Cape Point, South Africa, southeastern South Atlantic Ocean, 34°36'S 17°00'E, 2740 m depth.

Description. Based on holotype female, 17 mm. *Body* [shape not known]. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. Antenna 1 peduncular articles 1 and 2 without anterodistal lobe; accessory flagellum 2-articulate, terminal article small, offset; flagellum with strong 2-field callynophore; robust setae present on proximal articles; calceoli absent. Antenna 2 [not known]. Epistome/upper lip [not known]. *Mandible* molar columnar with oval, fully triturating surface; *palp attached extremely distally*, article 3 without proximal A3-setae. Maxilla 1 outer plate with setal-tooth 7 [symmetry not known], cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 2 long, slender apical robust setae.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis sparsely setose along anterior margin; ischium short; carpus long (3.1 × breadth), longer than propodus, without posterior lobe; *propodus* small, margins subparallel, *palm acute*, entire, straight. Pereonite 2 [not known]. Gnathopod 2 palm slightly obtuse. Pereonites 3–6 [dorsal margins unknown]. *Pereopod 5* coxa without distinct lateral ridge; *basis* longer than broad, *posterior margin with mid-central spine*, with well-developed slender posteroventral lobe. Pereonite 7 with mid-dorsal carina (slightly developed). Pereopod 7 [unknown].

Pleonite 1 with mid-dorsal carina. Pleonite 2 with dorsal carina, rounded dorsodistally. *Pleonite 3 with mid-dorsal carina, with irregular mid-dorsal margin, posterodorsal margin produced.* Epimeron 3 [unknown]. Urosomite 1 with mid-dorsal, tube-shaped carina. Uropod 3 outer ramus article 2 short, with plumose setae on each ramus. *Telson* deeply cleft, without dorsal robust setae, *without apical robust setae.*

Etymology. Named for Dr Frank Talbot, collector of the type material, renowned zoologist and yachtsman, and previous Director of both the South African Museum and the Australian Museum.

Remarks. *Lepidepecreoides talboti* was considered by Griffiths (1977) to be the same species as *L. nubifer* J.L. Barnard, 1971. Griffiths considered the morphological differences between his material and that of Barnard to be not taxonomically significant. Based on our examination of known species in the genus and the geographical distance between the two populations, we consider the taxa to be separate species. *Lepidepecreoides talboti* differs from *L. nubifer* in the length of the gnathopod 1 carpus, the dorsal shape of the pleonites and the setation of the telson.

We have assumed that the segments of the dorsal profile in figure 4 I of Griffiths (1977) have been mis-labelled, and

that the segment labelled "3" is really urosomite 1, etc. It would otherwise seem inconceivable that Griffiths would identify his material as *L. nubifer*, which has no strong dorsal projection on pleonite 3.

Distribution. Cape Basin, southeastern South Atlantic Ocean; 2740 m depth.

Lepidepecreoides torresi n.sp.

Figs. 7–9

Type material. HOLOTYPE, female, with non-setose oostegites, 6.8 mm, AM P57734, E of Cape York, Australia, Coral Sea, 10°32.72'S 144°12.8'E, 780–795 m, epibenthic sled, P. Hutchings *et al.*, 20 August 1988, RV *Franklin*, stn 06/88-03.

Type locality. East of Cape York, Australia, Coral Sea, 10°32.72'S 144°12.8'E, 780–795 m depth.

Description. Based on holotype female, 6.8 mm. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. Antenna 1 peduncular articles 1 and 2 without anterodistal lobe; accessory flagellum 2-articulate, terminal article small, offset; flagellum with strong 2-field callynophore; robust setae present on proximal articles; calceoli absent. Antenna 2 flagellum short, calceoli absent. [Epistome/upper lip unknown]. *Mandible* molar columnar with oval, fully triturating surface; *palp attached distally*, article 3 with proximal A3-seta. Maxilla 1 outer plate with left and right setal-tooth 7 symmetrical, cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 2 (one slender, one broad) apical robust setae.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis sparsely setose along anterior margin; ischium short; carpus long (2.3 × breadth), longer than propodus, without posterior lobe; *propodus* small, margins subparallel, *palm slightly acute*. Pereonite 2 without mid-dorsal carina. Gnathopod 2 palm transverse. Pereonite 3 without mid-dorsal carina. Pereonite 4 without mid-dorsal carina. Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereonite 5 without mid-dorsal carina. *Pereopod 5* coxa with distinct lateral ridge; *basis* about as long as broad, posterior margin with mid-central spine, *with well-developed wedge-shaped posteroventral lobe*. Pereonite 6 without mid-dorsal carina. Pereonite 7 without mid-dorsal carina. Pereopod 7 basis posterodistally produced, not reaching merus, not posterodistally excavate.

Pleonite 1 without mid-dorsal carina. Pleonite 2 without mid-dorsal carina. *Pleonite 3 with mid-dorsal carina, not dorsodistally produced, posterodorsal margin produced.* Epimeron 3 posterior margin smooth, posteroventral corner broadly rounded. Urosomite 1 with deep notch and subtriangular, acutely produced boss. Uropod 3 outer ramus article 2 short; with plumose setae on each ramus. *Telson* deeply cleft, with dorsal robust setae, *with 1 apical robust seta on each lobe.*

Etymology. Named for Luis Vaez de Torres, commander of the *San Pedro*, which, in 1606, was the first European vessel to sail through the strait that now bears Torres' name.

Distribution. Coral Sea, western South Pacific Ocean; 780–795 m depth.

Lepidepecreoides xenopus K.H. Barnard

Fig. 10

Lepidepecreoides xenopus K.H. Barnard, 1931: 426.–K.H. Barnard, 1932: 62, fig. 24.–J.L. Barnard, 1958: 93.–Thurston & Allen, 1969: 360.–Lowry & Bullock, 1976: 93.–Barnard & Karaman, 1991: 496.–Ren & Huang, 1991: 247, fig. 37.–De Broyer & Jazdzewski, 1993: 15, 69.

Material examined. Three specimens, 4.0–4.5 mm, and 1 partial specimen, USNM 306582, Weddell Sea, Antarctica, 74°07'S 39°38'W, 731 m, epibenthic sled, 6 February 1968, USCGC *Glacier*, IWSOE cruise 1, stn 0001. —1 male, 9.5 mm, NMV J47714, off Enderby Land, Antarctica, Southern Ocean, 65°50.10'S 50°34.30'E to 65°50.30'S 50°34.90'E, 540 m, rock with mud and clay patches, WHOI epibenthic sled, M. Norman, MS *Nella Dan*, stn HRD 011. —1 specimen, 6.0 mm, NMV J38225, Amery Depression, Antarctica, 68°04.36'S 72°17.81'E to 68°04.44'S 72°18.11'E, 765 m, epibenthic sled, 17 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-151.

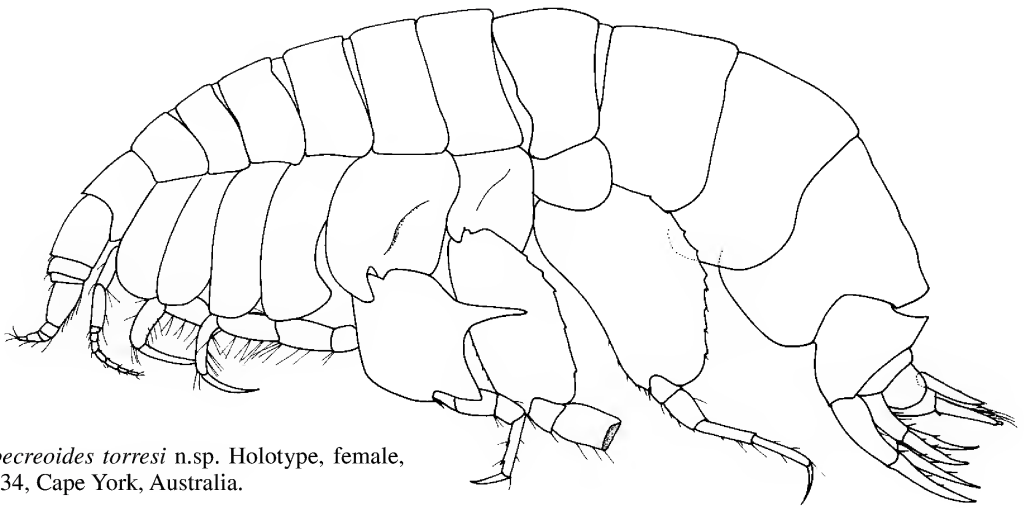

Figure 7. *Lepidepecreoides torresi* n.sp. Holotype, female, 6.8 mm, AM P57734, Cape York, Australia.

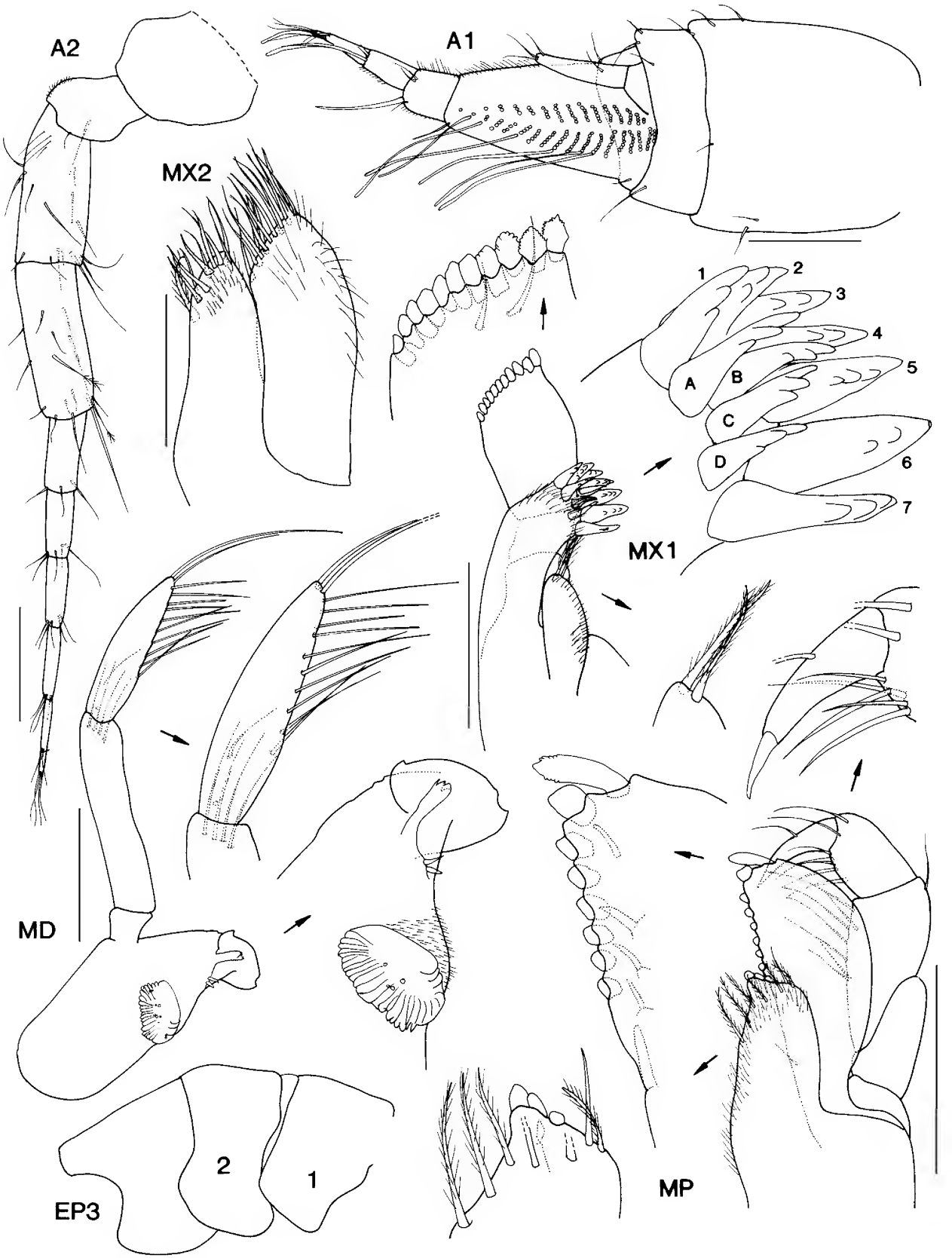

Figure 8. *Lepidepecreoides torresi* n.sp. Holotype, female, 6.8 mm, AM P57734, Cape York, Australia. Scales represent 0.2 mm.

Type locality. Schollaert Channel, Palmer Archipelago, Antarctica, [approx. 64°30'S 62°50'W], 160–335 m depth.

Description. Head with lateral cephalic lobe subtriangular, apically subacute; eyes apparently absent. Antenna 1 peduncular articles 1 and 2 with weakly developed anterodistally rounded lobe; accessory flagellum 2-articulate, terminal article small, offset; flagellum with

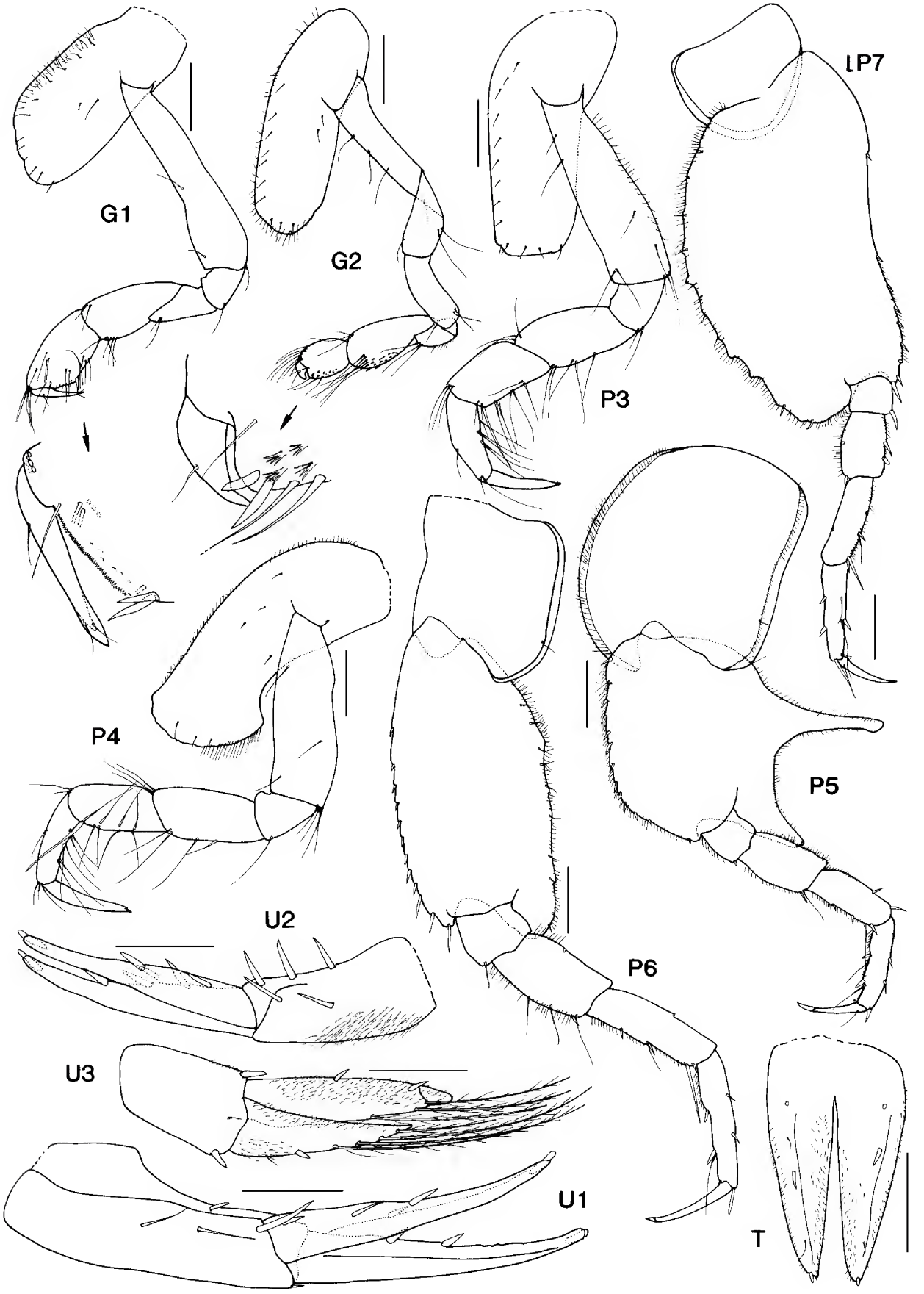

Figure 9. *Lepidepecreoides torresi* n.sp. Holotype, female, 6.8 mm, AM P57734, Cape York, Australia. Scales represent 0.2 mm.

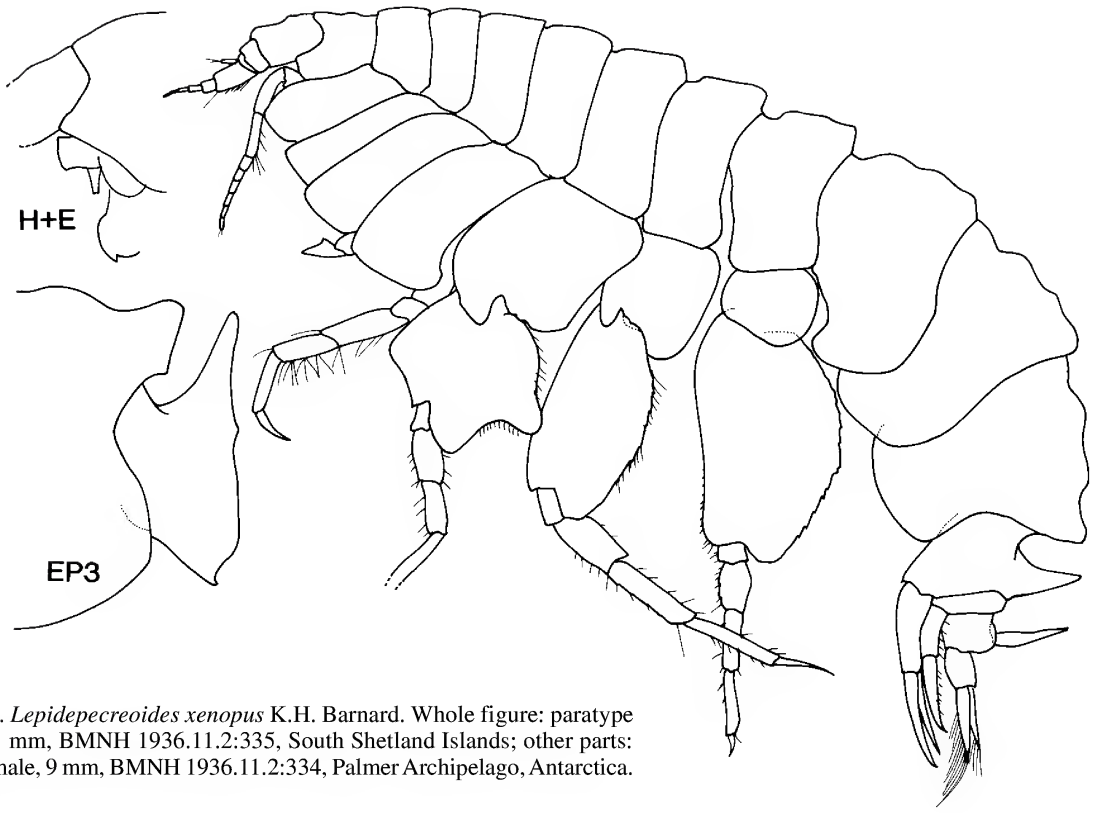

Figure 10. *Lepidepecreoides xenopus* K.H. Barnard. Whole figure: paratype female, 11 mm, BMNH 1936.11.2:335, South Shetland Islands; other parts: holotype male, 9 mm, BMNH 1936.11.2:334, Palmer Archipelago, Antarctica.

strong 2-field callynophore; robust setae present on proximal articles; calceoli absent. Antenna 2 flagellum short, calceoli absent. Epistome/upper lip with upper lip slightly produced, straight. *Mandible* molar columnar, with subcircular or oval, fully triturating surface; *palp attached distally*, article 3 with proximal A3-seta. Maxilla 1 outer plate with setal-tooth 7 cuspidate distally along inner margin; palp distal margin with apical robust setae. Maxilliped outer plate with 2, long, (one slender, one broad) apical robust setae.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis sparsely setose along anterior margin; ischium short; carpus long (2.4 × breadth), longer than propodus, without posterior lobe; *propodus* small, margins subparallel, *palm acute*. Gnathopod 2 palm slightly obtuse. Pereonite 3 with mid-dorsal carina. Pereonite 4 with mid-dorsal carina. Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereonite 5 with mid-dorsal carina. *Pereopod 5* coxa with distinct lateral ridge; *basis* about as long as broad, posterior margin with mid-central spine; *with well-developed posteroventral lobe*. Pereonite 6 with mid-dorsal carina. Pereonite 7 with mid-dorsal carina. Pereopod 7 basis posterodistally produced, not reaching merus, not posterodistally excavate.

Pleonite 1 with mid-dorsal carina. Pleonite 2 with mid-dorsal carina. *Pleonite 3 with mid-dorsal carina, dorsodistally produced, apically rounded, posterodorsal margin produced*. Epimeron 3 posterior margin smooth, posteroventral corner broadly rounded. Urosomite 1 with a narrow vertically produced recurved acute spine. Uropod 3 outer ramus article 2 short, with plumose setae on each ramus. *Telson* deeply cleft, without dorsal robust setae, *with 1 apical robust seta on each lobe*.

Remarks. We have examined the type material of *L. xenopus* and, in all three specimens, the dorsal projection on pleonite 3 is more rounded than indicated in K.H. Barnard's whole-animal figure of the male holotype. All six specimens recorded here have similar projections on pleonite 3 and urosomite 1, and a rounded posteroventral lobe on pereopod 5 basis. Five of the six specimens have a well-developed spine on the mid-posterior margin of pereonite 5 basis, as K.H. Barnard showed for his "juvenile" (an immature male). The 6 mm specimen from the Amery Depression has a rounded lobe on the posterior margin, similar to that of the holotype male and paratype female.

Distribution. Antarctic Peninsula, South Georgia, South Shetland Islands, Weddell Sea, Enderby Land and Amery Depression, Antarctica; 130–1080 m depth.

Lepidepecreum Bate & Westwood

Diagnosis. Body expanded to form a lateral bulge (not known for all species). Antenna 2 peduncular article 3 elongate. Mandible molar columnar (sometimes reduced) oval, fully triturating. Gnathopod 1 coxa large, about as long as coxa 2 (more than 0.7 ×); carpus long (length 2 to 3.9 × breadth). Uropod 3 outer ramus 2-articulate.

Lepidepecreum baudini n.sp.

Figs. 11–13

Type material. HOLOTYPE, female, 5.5 mm, NMV J47715; 1 PARATYPE, male, 7.5 mm, NMV J47716; 1 PARATYPE, immature male, 6.5 mm, NMV J47717; 14 PARATYPES, NMV J47718; 5 PARATYPES, AM P57735; 76 km S of Point Hicks, Victoria,

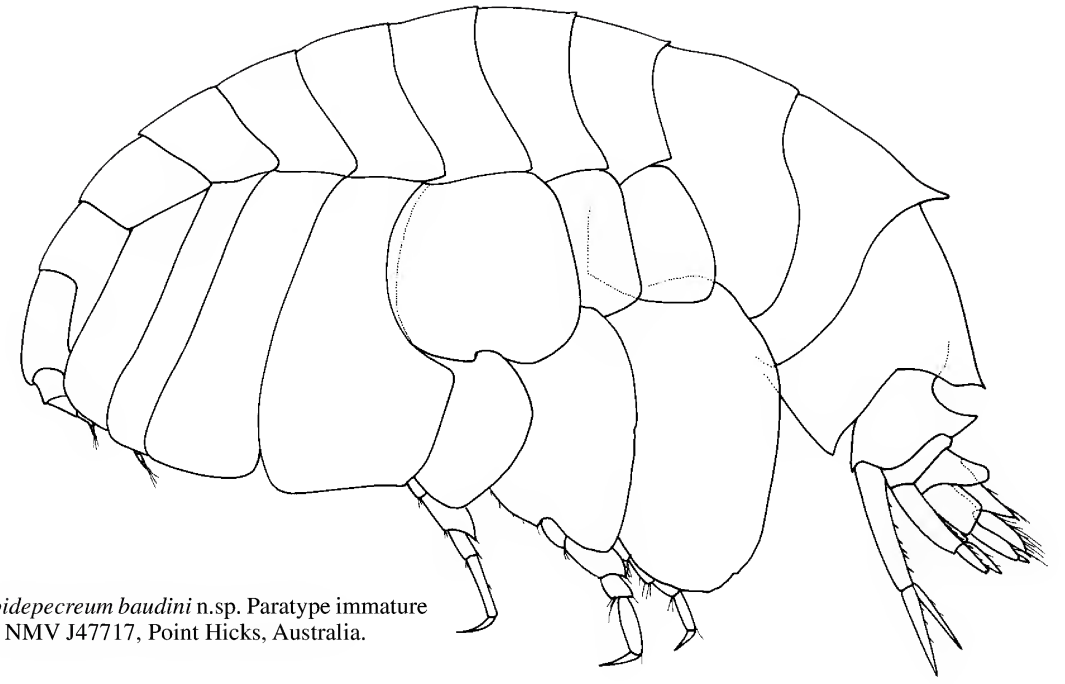

Figure 11. *Lepidepecreum baudini* n.sp. Paratype immature male, 6.5 mm, NMV J47717, Point Hicks, Australia.

Australia, 38°29.33'S 149°19.98'E, 1840 m, sandy mud, fine shell, WHOI epibenthic sled, G.C.B. Poore *et al.*, 26 October 1988, RV *Franklin* stn SLOPE 69. —1 PARATYPE, NMV J47719, 96 km S of Point Hicks, Victoria, Australia, 38°40.29'S 149°18.06'E, 2900 m, compacted clay, WHOI epibenthic sled, G.C.B. Poore *et al.*, 25 October 1988, RV *Franklin* stn SLOPE 66. —1 PARATYPE, AM P57736, E of Cape Naturaliste, Tasmania, Australia, 40°45.94'S 149°01.62'E to 40°46.54'S 149°00.27'E, 2400–2500 m, mud, clay, R.T. Springthorpe, 10 December 1986, RV *Franklin* stn 1086–04.

Type locality. 76 km S of Point Hicks, Victoria, Australia, 38°29.33'S 149°19.98'E, 1840 m depth.

Description. Based on holotype female, 5.5 mm. *Body* expanded to form a lateral bulge. *Head with lateral cephalic lobe a semidome, apically subacute. Antenna 1 peduncular articles 1 and 2 without anterodistal lobe*; accessory flagellum 2-articulate; flagellum without callynophore; robust setae absent from proximal articles; calceoli absent. Antenna 2 peduncular article 3 elongate; flagellum short, calceoli absent. Epistome/upper lip with epistome produced beyond upper lip, broadly rounded. Mandible molar columnar with oval, fully triturating surface; mandibular palp attached proximally, article 3 without proximal A3-setae. Maxilla 1 outer plate with setal-tooth 7 present, left and right asymmetrical, cuspidate distally; palp distal margin with apical robust setae. Maxilliped outer plate with 1 short, slender apical robust seta.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis moderately setose along anterior margin*; ischium short; carpus long, subequal in length to propodus, without posterior lobe; propodus with margins subparallel, *palm acute, entire, concave. Gnathopod 2 palm slightly obtuse. Pereopod 4 coxa without distinct lateral ridge*, with a well-developed posteroventral lobe. *Pereonite 5 dorsally smooth. Pereopod 5 coxa without distinct lateral ridge, without umbo, basis about as long as broad. Pereopod 7 basis posterodistally produced beyond merus.*

Pleonite 1 dorsally smooth, *not produced dorsodistally. Pleonite 2* with mid-dorsal carina, *acutely produced posterodistally. Pleonite 3* with mid-dorsal carina, *produced dorsodistally, apically acute, posterodorsal margin produced. Epimeron 3* posterior margin smooth, *postero-ventral corner acutely produced.* Urosomite 1 with a narrow vertically produced recurved acute spine. *Uropod 3 inner and outer rami well developed; outer ramus article 2 short*; without plumose setae on rami. *Telson moderately cleft*, with dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male, 7.5 mm. Antenna 1 flagellum with strong 2-field callynophore; calceoli present. Antenna 2 flagellum elongate; calceoli present. Uropod 3 with plumose setae on each ramus.

Etymology. Named for Nicolas Baudin, captain of the French corvette *Géographe* which together with the *Naturaliste* made an extensive scientific exploration of Australia's southern coast in 1801–1802.

Remarks. *Lepidepecreum baudini* is one of a group of seven species in which the basis of pereopod 7 is developed beyond the merus: *L. baudini*; *L. clypeatum* Chevreux, 1888; *L. clypodentatum* J.L. Barnard, 1962; *L. dampieri*; *L. flindersi*; *L. freycineti*; and *L. subclypeatum* Ruffo & Schiecke, 1977. Within this group *L. baudini* and *L. dampieri* have no anterodistal lobes on the peduncle of antenna 1. *Lepidepecreum baudini* differs from *L. dampieri* most noticeably in the well-developed mid-dorsal carina on pleonite 2.

Distribution. Southeastern Australia, Tasman Sea; 1840–2500 m depth.

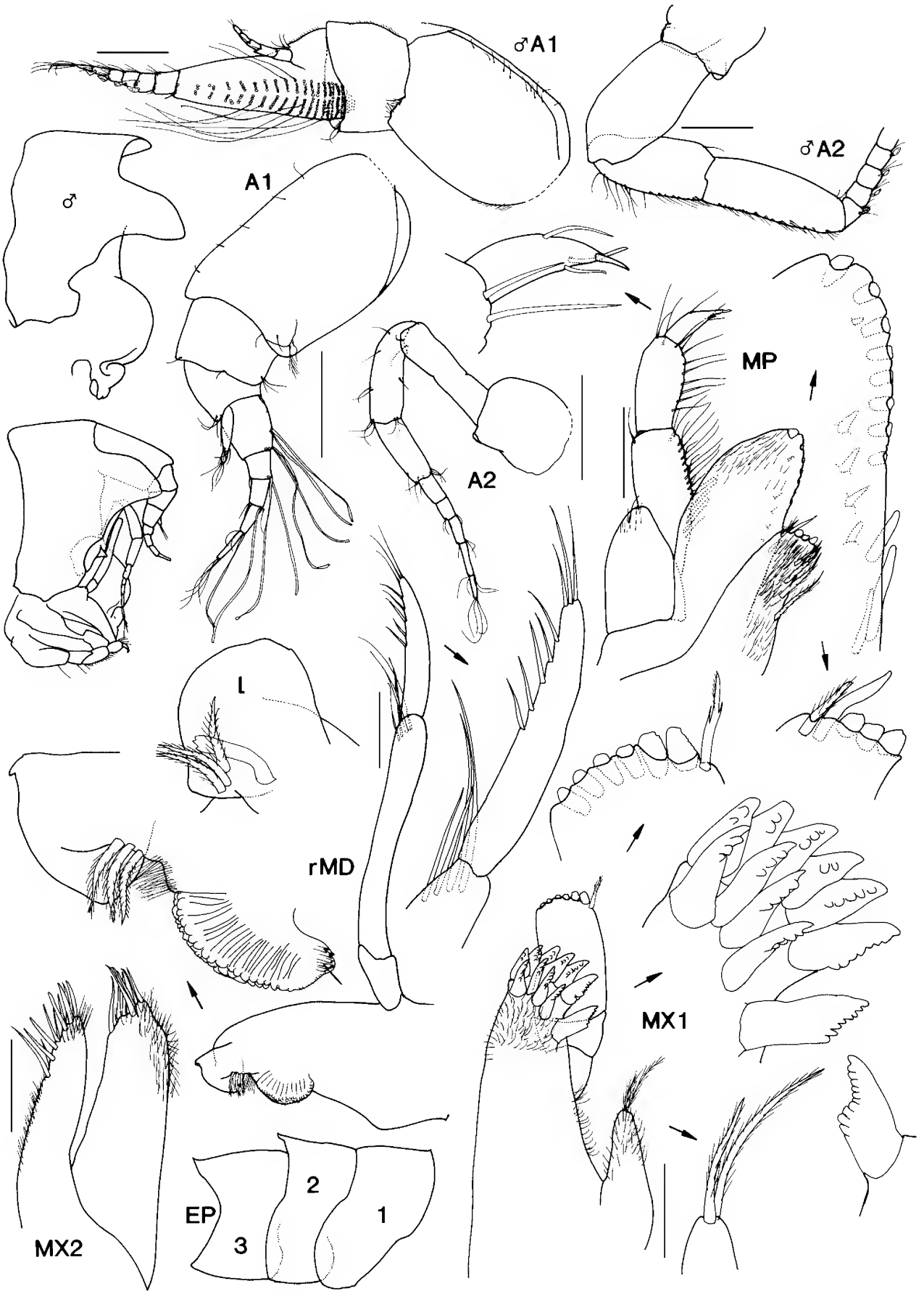

Figure 12. *Lepidepecreum baudini* n.sp. Holotype female, 5.5 mm, NMV J47715; paratype male, 6.5 mm, NMV J47717; Point Hicks, Australia. Scales for A1,2 represent 0.2 mm, remainder represent 0.1 mm.

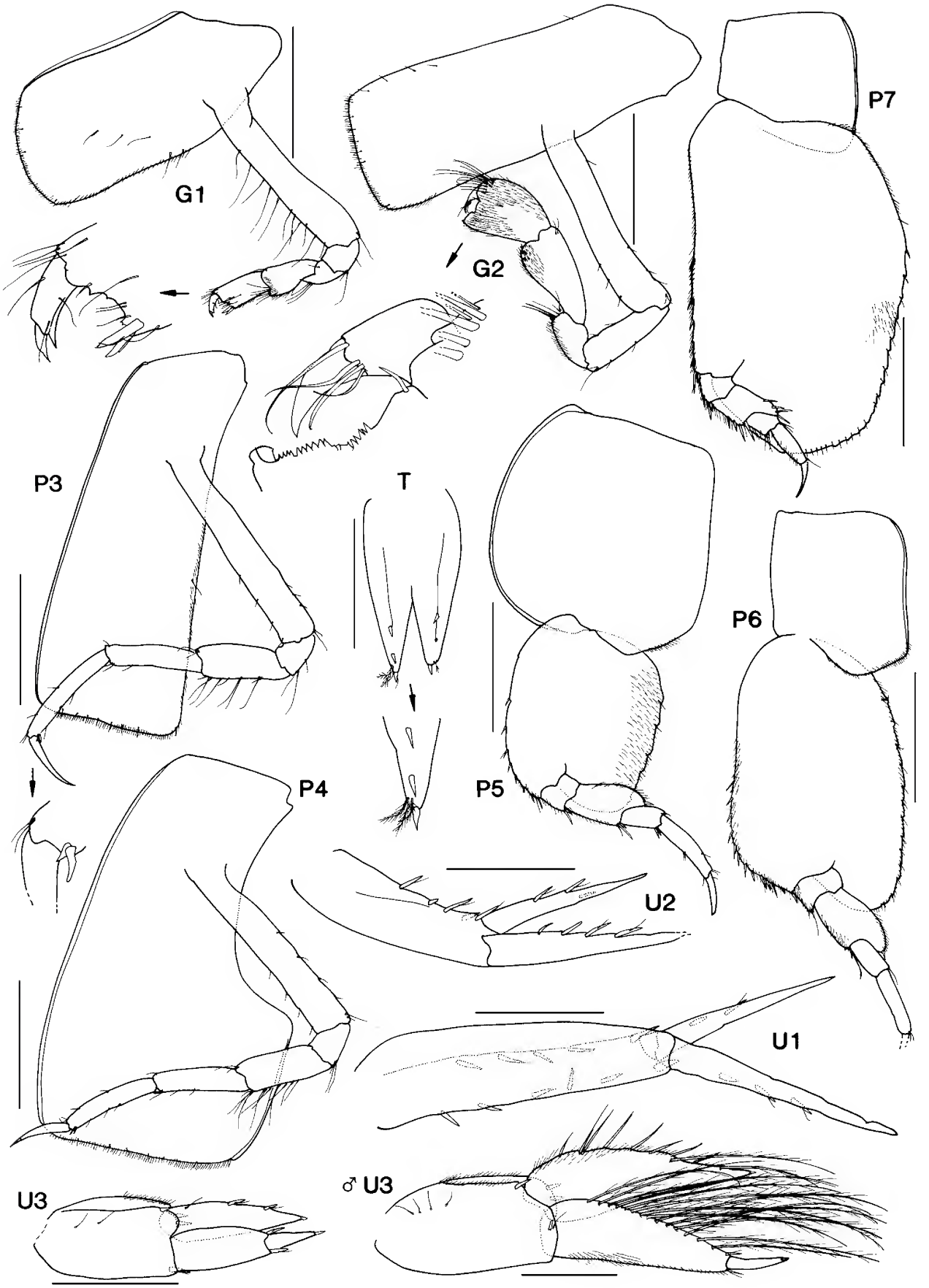

Figure 13. *Lepidepecreum baudini* n.sp. Holotype female, 5.5 mm, NMV J47715; paratype male, 6.5 mm, NMV J47717; Point Hicks, Australia. Scales for U1–3, T represent 0.1 mm, remainder represent 0.5 mm.

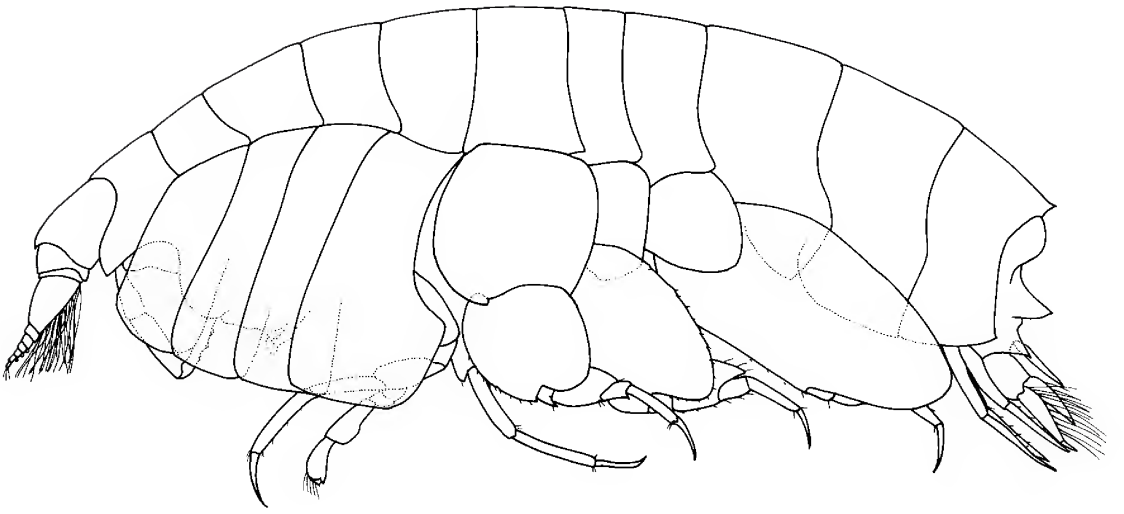

Figure 14. *Lepidepecreum dampieri* n.sp. Holotype male, 3.5 mm, NMV J7670, North West Shelf, Australia.

Lepidepecreum dampieri n.sp.

Figs. 14–16

Type material. HOLOTYPE, male, 3.5 mm, NMV J7670, between Port Hedland and Dampier, North West Shelf, Western Australia, eastern Indian Ocean, 19°05'00"S 117°26'00"E to 19°05'00"S 117°46'23"E, 120–122 m, muddy sand, dredge, 6 December 1983, G.C.B. Poore & H.M. Lew Ton, FRV *Soela* stn S03/83 [NMV stn NWA-52].

Type locality. Between Port Hedland and Dampier, North West Shelf, Western Australia, eastern Indian Ocean, 19°05'00"S 117°26'00"E to 19°05'00"S 117°46'23"E, 120–122 m depth.

Description. Based on holotype male, 3.5 mm. Body expanded to form a lateral bulge. *Head with lateral cephalic lobe a semidome, apically subacute. Antenna 1 peduncular articles 1 and 2 without anterodistal lobe;* accessory flagellum 2-articulate; flagellum with strong 2-field callynophore [not known for female]; robust setae absent from proximal articles; calceoli present. Antenna 2 peduncular article 3 elongate; flagellum elongate; calceoli present. Epistome/upper lip [not known]. Mandible molar columnar with oval, fully triturating surface; mandibular palp attached proximally, article 3 without A3-setae. Maxilla 1 outer plate with setal-tooth 7 [symmetry unknown] cuspidate distally; palp distal margin with apical robust setae. Maxilliped outer plate with 1 short, slender apical robust seta.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis sparsely setose along anterior margin*; ischium short; carpus long, subequal in length to propodus, without posterior lobe; propodus margins subparallel, *palm acute, entire, straight. Gnathopod 2 palm slightly obtuse. Pereopod 4 coxa without distinct lateral ridge*, with a well-developed posteroventral lobe. *Pereonite 5 dorsally smooth. Pereopod 5 coxa without distinct lateral ridge, without umbo, basis about as long as broad. Pereopod 7 basis posterodistally produced beyond merus.*

Pleonite 1 without mid-dorsal carina, *not produced dorsodistally. Pleonite 2* without mid-dorsal carina, *not produced dorsodistally. Pleonite 3* with mid-dorsal carina, *produced dorsodistally, apically acute, posterodorsal margin produced. Epimeron 3* posterior margin smooth, *posteroventral corner subquadrate.* Urosomite 1 with deep notch and a narrow vertically produced acute spine. *Uropod 3 inner and outer rami well developed; outer ramus article 2 short*; with plumose setae on each ramus. *Telson moderately cleft*, with dorsal robust setae, with 1 apical robust seta on each lobe.

Etymology. Named for the English privateer William Dampier, who visited northwestern Australia in 1688 and 1699 and has been described as Australia's first naturalist.

Remarks. *Lepidepecreum dampieri* is also one of a group of seven species in which the basis of pereopod 7 is developed beyond the merus. *Lepidepecreum dampieri* is most similar to *L. baudini* (see *L. baudini* remarks).

Distribution. North West Shelf, Australia, eastern Indian Ocean; 120–122 m depth.

Lepidepecreum flindersi n.sp.

Figs. 17–19

Type material. HOLOTYPE, female, ovigerous (4 eggs), 4.0 mm, NMV J47720; 1 PARATYPE, male, 4.8 mm, NMV J47721; 5 PARATYPES, NMV J47722; 5 PARATYPES, AM P57737; 85 km NE of North Point, Flinders Island, eastern Bass Strait, Australia, 39°02.4'S 148°30.6'E, 120 m, muddy sand, dredge, R. Wilson, 15 November 1981, RV *Tangaroa*, cruise 81-T-1, stn BSS 169. —2 PARATYPES, NMV J47723, 100 km NE of North Point, Flinders Island, eastern Bass Strait, Australia, 38°51.8'S 148°26.5'E, 130 m, fine sand, epibenthic sled, R. Wilson, 15 November 1981, RV *Tangaroa*, cruise 81-T-1, stn BSS 170. —2 PARATYPES, NMV J47724, S of Point Hicks, Victoria, Australia, 38°17.70'S 149°11.30'E, 400 m, coarse sand, gravel, mud, many sponges, WHOI epibenthic sled, M.F. Gomon *et al.*, 24 July 1986, RV *Franklin*, stn SLOPE 40.

Type locality. 85 km NE of North Point, Flinders Island, eastern Bass Strait, Australia, 39°02.4'S 148°30.6'E, 120 m depth.

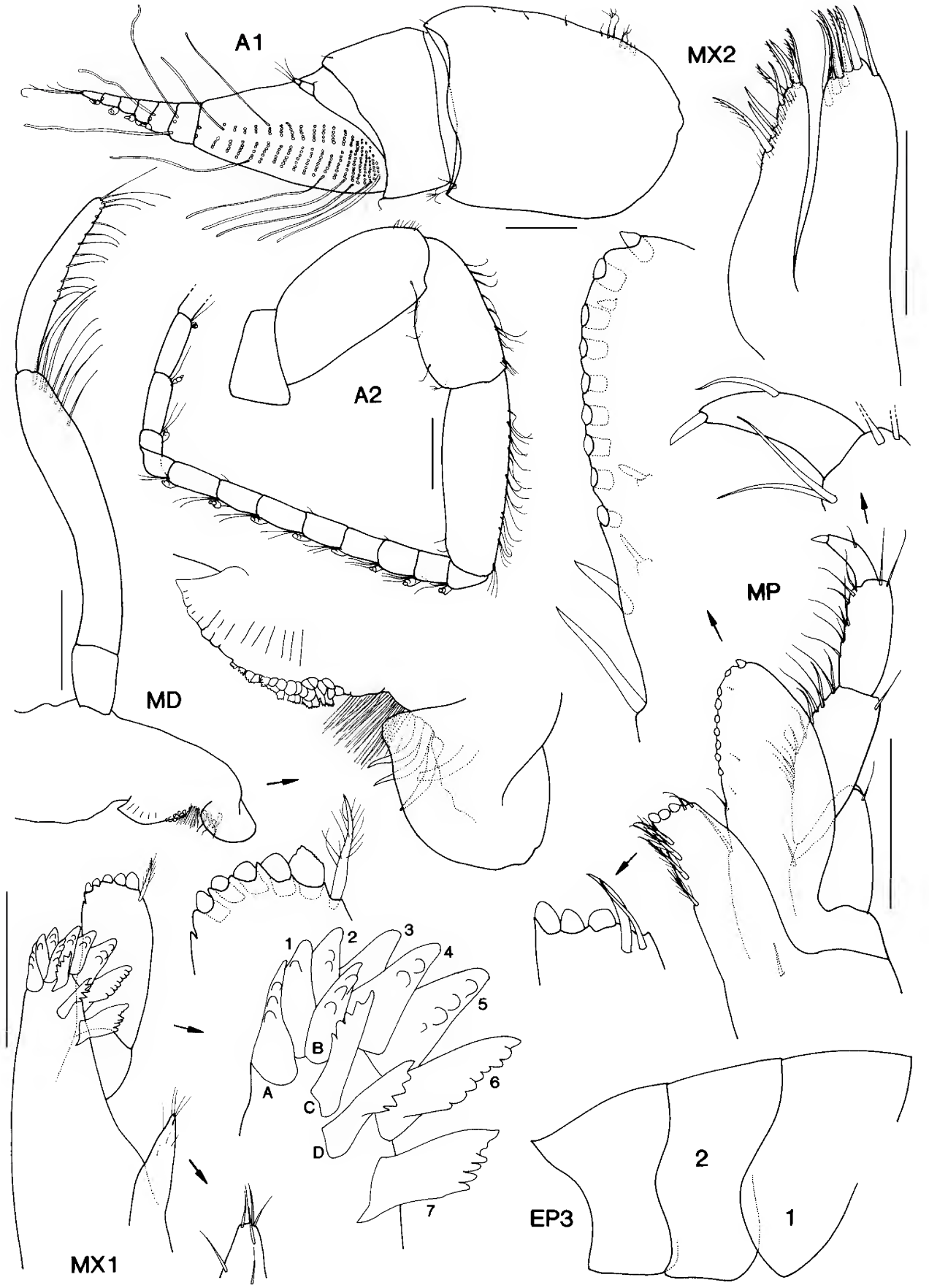

Figure 15. *Lepidepecreum dampieri* n.sp. Holotype male, 3.5 mm, NMV J7670, North West Shelf, Australia. Scales represent 0.1 mm.

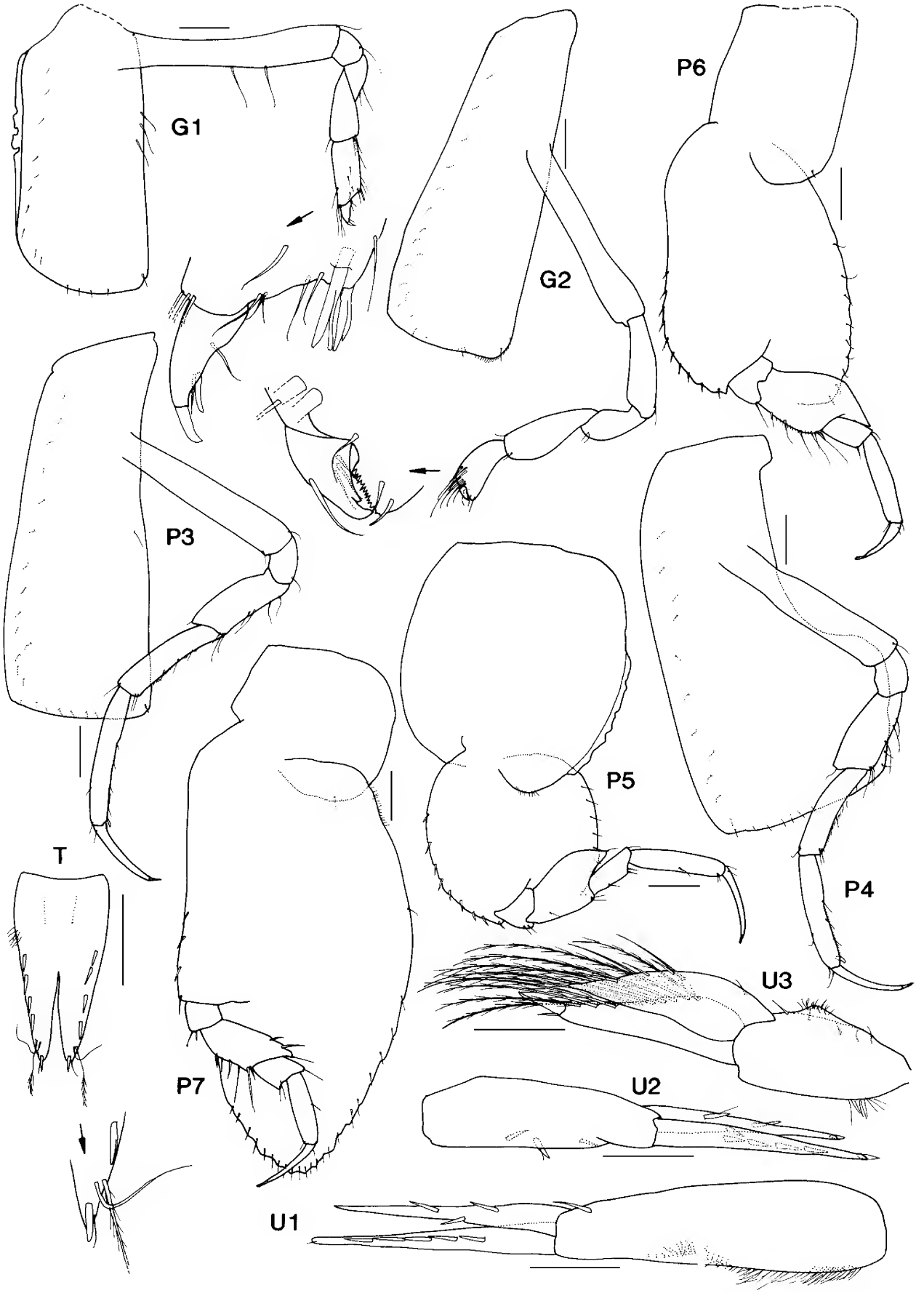

Figure 16. *Lepidepecreum dampieri* n.sp. Holotype male, 3.5 mm, NMV J7670, North West Shelf, Australia. Scales represent 0.1 mm.

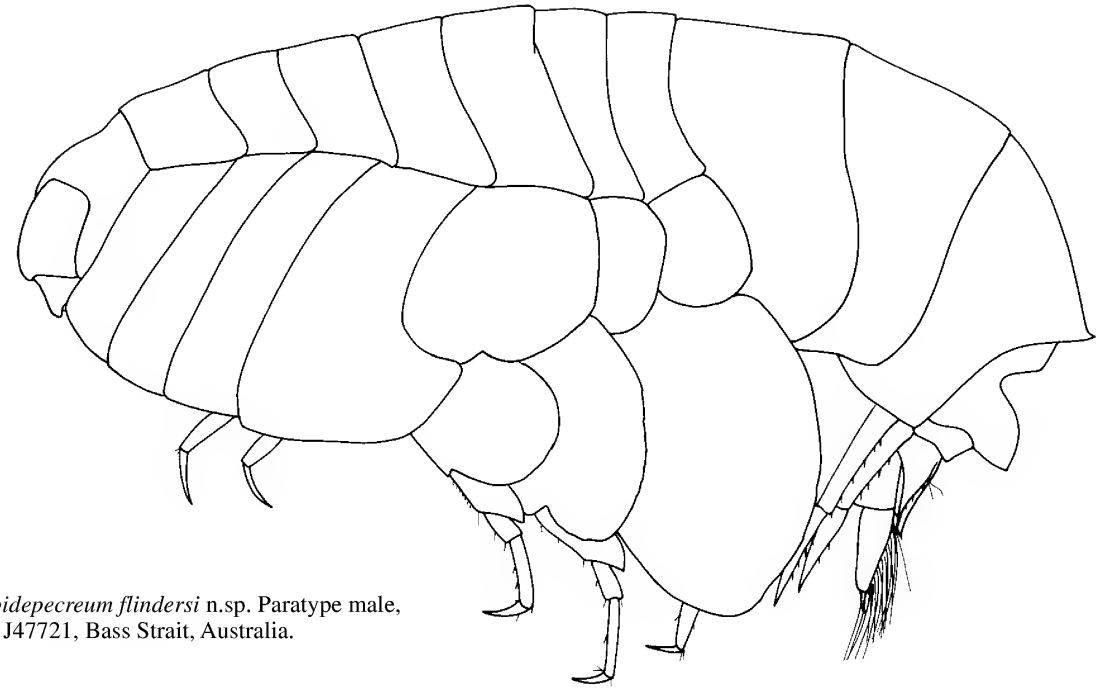

Figure 17. *Lepidepecreum flindersi* n.sp. Paratype male, 4.8 mm, NMV J47721, Bass Strait, Australia.

Description. Based on holotype female, 4.0 mm. Body expanded to form a lateral bulge. *Head with lateral cephalic lobe semidome, apically rounded. Antenna 1 peduncular article 1 without anterodistal lobe, peduncular article 2 with well-developed anterodistally rounded lobe*; accessory flagellum 2-articulate; flagellum with weak 1-field callynophore; robust setae absent from proximal articles; calceoli absent. Antenna 2 peduncular article 3 elongate; flagellum short; calceoli absent. Epistome/upper lip with epistome produced beyond upper lip, broadly rounded; upper lip not produced. Mandible molar columnar with oval, fully triturating surface; mandibular palp attached proximally, article 3 without A3-setae. Maxilla 1 outer plate with setal-tooth 7 present, left and right asymmetrical, cuspidate distally; palp distal margin with apical robust setae. Maxilliped outer plate with 1 short, slender apical robust seta.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis sparsely setose along anterior margin*; ischium short; carpus long, subequal in length to propodus, without posterior lobe; propodus with margins subparallel, *palm acute, entire, straight. Gnathopod 2 palm obtuse. Pereopod 4 coxa without distinct lateral ridge*, with a well-developed posteroventral lobe. *Pereonite 5 dorsally smooth. Pereopod 5 coxa without distinct lateral ridge, without umbo, basis about as long as broad. Pereopod 7 basis posterodistally produced beyond merus.*

Pleonite 1 without mid-dorsal carina, *not produced dorsodistally. Pleonite 2* without mid-dorsal carina, *not produced dorsodistally. Pleonite 3* with mid-dorsal carina, *produced dorsodistally, apically acute, posterodorsal margin produced. Epimeron 3* posterior margin smooth, *posteroventral corner subquadrate.* Urosomite 1 without notch, with subtriangular, acutely produced boss. *Uropod 3 inner and outer rami well developed; outer ramus article 2 short*; without plumose setae on rami. *Telson moderately cleft*, without dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male, 4.8 mm. Antenna 1 flagellum with strong 2-field callynophore; calceoli present. Antenna 2 flagellum elongate, calceoli present. Urosomite 1 with notch, with subtriangular, acutely produced boss. Uropod 3 with plumose setae on each ramus. Telson with dorsal robust setae.

Etymology. Named for Matthew Flinders, captain of the first vessel to circumnavigate Australia.

Remarks. *Lepidepecreum flindersi* is one of a group of seven species in which the basis of pereopod 7 is developed beyond the merus. It is most similar to the Australian species *L. baudini* and *L. dampieri*, but differs from these species in the strongly produced dorsodistal lobe on peduncular article 2 of antenna 1 and in the dorsal shape of urosomite 1.

Distribution. Bass Strait, Australia; 120–400 m depth.

Lepidepecreum foraminiferum Stebbing

Lepidepecreum foraminiferum Stebbing, 1888: 686, pl. 24.–Stebbing, 1906: 79.–J.L. Barnard, 1958: 93.–Thurston & Allen, 1969: 361.–Mills, 1972: 74, table 1.–Lowry & Bullock, 1976: 94.–Barnard & Karaman, 1991: 496.–De Broyer & Jazdzewski, 1993: 70.

Anonyx longicornis.–Della Valle, 1893: 814 (in part).

Lepidepecreum forameniferum [*sic*].–Gurjanova, 1962: 324 (key).

not *Lepidepecreum foraminiferum*.–Nayar, 1959: 7, pl. 1 figs. 16–26.–Nayar, 1966: 136.–Surya Rao, 1972: 199 (= *Lepidepecreum* sp.).

Material examined. Two specimens, NMV J47725, off Enderby Land, Antarctica, Southern Ocean, 65°56.40'S 50°52.10'E, 386–400 m, shelly mud, silt and bryozoan shell, WHOI epibenthic sled, M. Norman, 15 November 1985, MS *Nella Dan*, stn HRD 010. —3 females, NMV J38196, western part of MacRobertson Shelf, Antarctica, 66°53.69'S 63°06.34'E to 66°53.67'S 63°05.51'E, 367–439 m, epibenthic sled, M. O'Loughlin on RSV *Aurora Australis*,

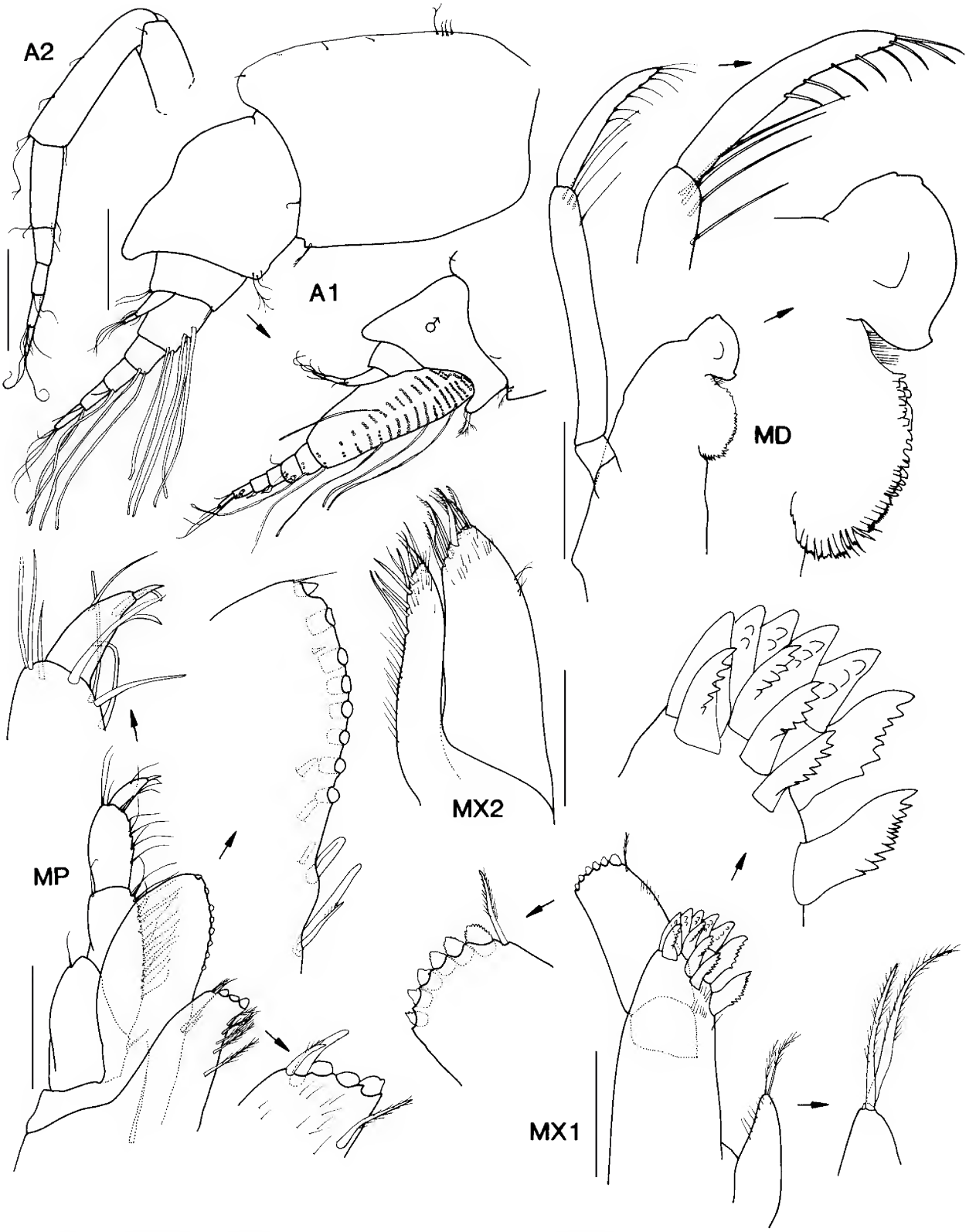

Figure 18. *Lepidepecreum flindersi* n.sp. Holotype female, 4.0 mm, NMV J47720; paratype male, 4.8 mm, NMV J47721; Bass Strait, Australia.

11 February 1993, stn AA93-125. —5 specimens (females and immature), NMV J38195, off the Larsemann Hills, eastern Prydz Bay, Antarctica, 68°54.88'S 76°37.03'E to 68°54.82'S 76°37.71'E, 667–716 m, epibenthic sled, 18 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-158.

Type locality. Off Cumberland Bay, Kerguelen Island, Southern Ocean, 48°45'0"S 69°14'0"E, 232 m depth.

Remarks. The material from India described as *L. foraminiferum* by Nayar (1959) is distinguished from this species by the absence of the strongly produced anterodistal

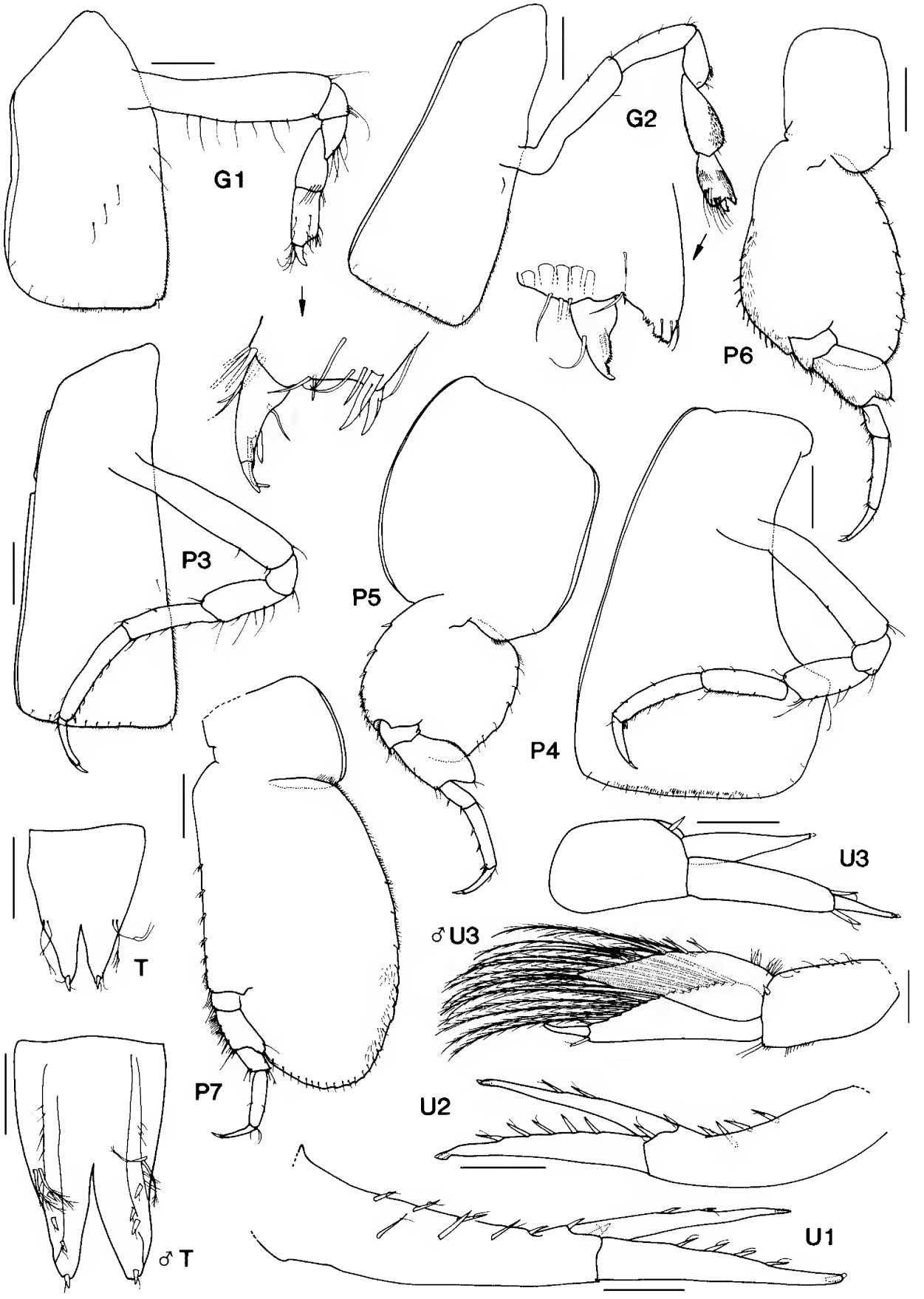

Figure 19. *Lepidepecreum flindersi* n.sp. Holotype female, 4.0 mm, NMV J47720; paratype male, 4.8 mm, NMV J47721; Bass Strait, Australia.

lobe on antenna 1 peduncular article 1; and by the shape of pereopod 7 merus, which has a strong posteroproximal shoulder.

The specimens reported here are the first records of *L. foraminiferum* since its original description from Kerguelen Island, and extend the species distribution from the subantarctic to the Antarctic continent.

Distribution. Enderby Land, MacRobertson Shelf and Prydz Bay, Antarctica; Kerguelen Island, Southern Ocean; 232–716 m depth.

Lepidepecreum freycineti n.sp.

Figs. 20–22

Type material. HOLOTYPE, female, ovigerous (8 eggs), 4.0 mm, NMV J47726; 4 PARATYPES, NMV J47727; 5 PARATYPES, AM P57738; off Freycinet Peninsula, Tasmania, Australia, 42°0.20'S 148°37.70'E, 720 m, coarse shelly sand, WHOI epibenthic sled, M.F. Gomon *et al.*, 27 July 1986, RV *Franklin*, stn SLOPE 46. —1 PARATYPE, NMV J47728, S of Point Hicks, Victoria, Australia, 38°19.10'S 149°14.30'E, 600 m, coarse sand, WHOI epibenthic sled, M.F. Gomon *et al.*, 24 July 1986, RV *Franklin* stn SLOPE 39. —1 PARATYPE, NMV J47729, off Freycinet Peninsula, Tasmania, Australia, 42°2.20'S 148°38.70'E, 800 m, coarse shelly sand, WHOI epibenthic sled, M.F. Gomon *et al.*, 27 July 1986, RV *Franklin*, stn SLOPE 45.

Type locality. Off Freycinet Peninsula, Tasmania, Australia, 42°0.20'S 148°37.70'E, 720 m depth.

Description. Based on holotype female, 4.0 mm. Body expanded to form a lateral bulge. *Head with lateral cephalic lobe semidome, apically subacute. Antenna 1 peduncular article 1 with well-developed anterodistally subacute lobe; article 2 without anterodistal lobe;* accessory flagellum 2-articulate; flagellum with weak 1-field callynophore; robust setae absent from proximal articles; calceoli absent. Antenna 2 peduncular article 3 elongate; flagellum short, calceoli absent. Epistome/upper lip with epistome produced beyond upper lip (slightly), broadly rounded. Mandible molar columnar with oval, fully triturating surface; mandibular palp attached proximally, article 3 without A3-setae. Maxilla 1 outer plate with left and right setal-tooth 7 asymmetrical, cuspidate distally; palp distal margin with apical robust setae. Maxilliped outer plate with 1 short, slender apical robust seta.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis sparsely setose along anterior margin*; ischium short; carpus long, subequal in length to propodus, without posterior lobe; propodus margins subparallel, *palm acute, entire, straight. Gnathopod 2 palm obtuse* (concave). *Pereopod 4 coxa without distinct lateral ridge*, with a well-developed posteroventral lobe. *Pereonite 5 dorsally smooth. Pereopod 5 coxa without distinct lateral ridge, without umbo, basis about as long as broad. Pereopod 7 basis posterodistally produced beyond merus.*

Pleonite 1 without mid-dorsal carina, *not produced dorsodistally. Pleonite 2* without mid-dorsal carina, *not produced dorsodistally. Pleonite 3* with mid-dorsal carina, *produced dorsodistally, apically acute, posterodorsal margin not produced. Epimeron 3* posterior margin smooth, *posteroventral corner narrowly rounded.* Urosomite 1 projecting over urosomite 2, with a narrow vertically produced recurved acute spine. *Uropod 3 inner ramus significantly reduced; outer ramus article 2 long*; without plumose setae on rami. *Telson moderately cleft*, with dorsal robust setae, with 1 apical robust seta on each lobe.

Etymology. Named for Louis de Freycinet, Lieutenant-Commander and cartographer on the French corvette *Naturaliste* and later Commander of the schooner *Casuarina* which accompanied the *Géographe* on the latter part of Baudin's voyage around the Australian coasts in 1802–1803.

Remarks. *Lepidepecreum freycineti* is also one of a group of seven species in which the basis of pereopod 7 is developed beyond the merus. It is similar to *L. clypeatum, L. clypodentatum* and *L. subclypeatum* in having a anterodistal lobe on peduncular article 1 of antenna 1. *Lepidepecreum freycineti* and *L. clypodentatum* are the only two species of this group without an anterodistal lobe on article 2. These two species are easily distinguished by the dorsodistal projections on pleonites 1 and 2 in *L. clypodentatum*.

Distribution. Southeastern Australia, Tasman Sea; 600–800 m depth.

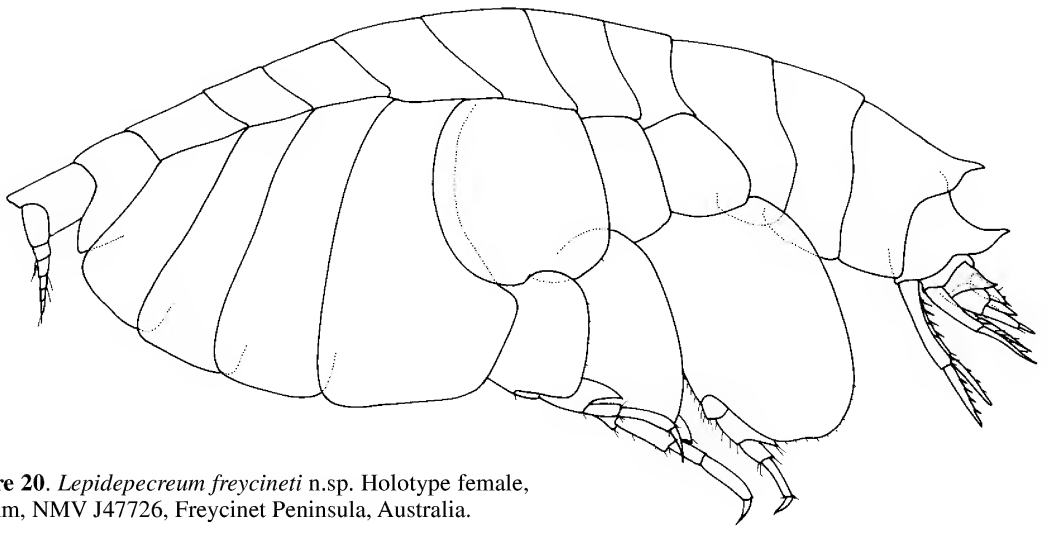

Figure 20. *Lepidepecreum freycineti* n.sp. Holotype female, 4.0 mm, NMV J47726, Freycinet Peninsula, Australia.

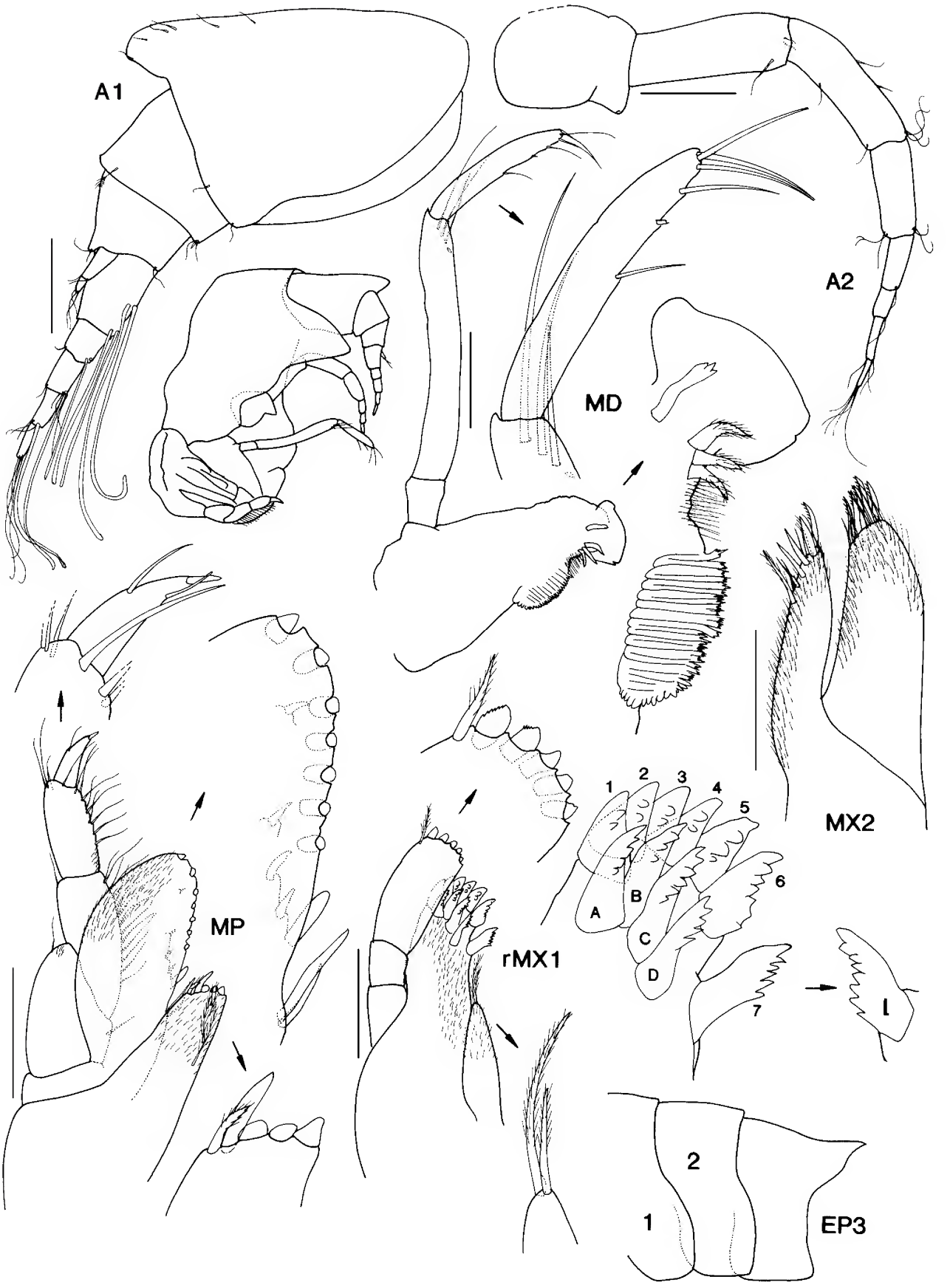

Figure 21. *Lepidepecreum freycineti* n.sp. Holotype female, 4.0 mm, NMV J47726, Freycinet Peninsula, Australia. Scales represent 0.1 mm

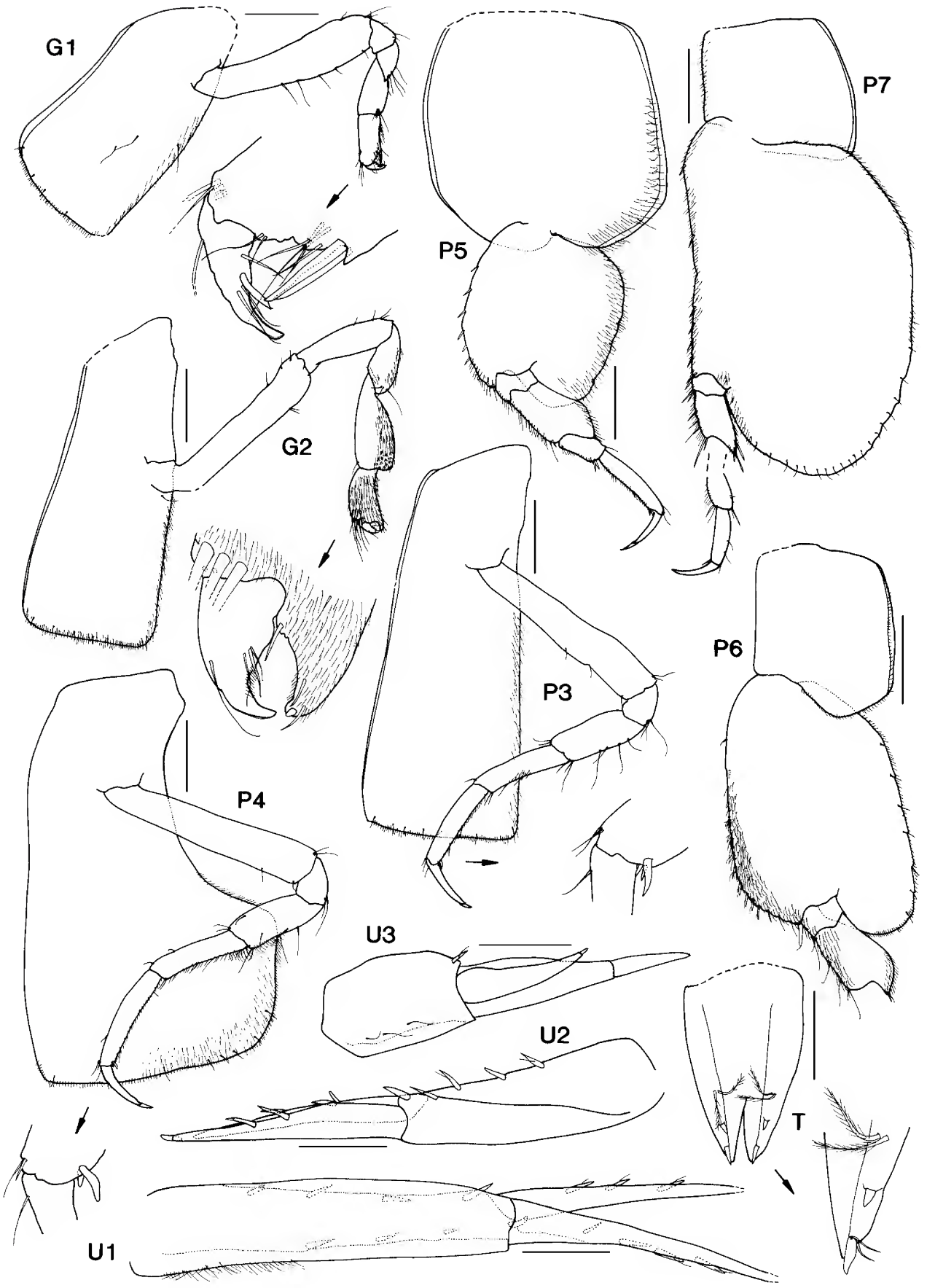

Figure 22. *Lepidepecreum freycineti* n.sp. Holotype female, 4.0 mm, NMV J47726, Freycinet Peninsula, Australia. Scales for U1–3, T represent 0.1 mm, remainder represent 0.2 mm.

Lepidepecreum infissum Andres

Lepidepecreum infissum Andres, 1983: 191, fig. 3.–Andres, 1985: 134.–Barnard & Karaman, 1991: 496.–De Broyer & Jazdzewski, 1993: 70.

Material examined. One specimen, NMV J38269, southern part of Amery Depression, Antarctica, 68°59.20'S 74°59.56'E, 746 m, diatomaceous ooze, Van Veen grab, 22 January 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-37. —23 specimens, NMV J38270, western part of MacRobertson Shelf, Antarctica, 66°55.51'S 62°32.72'E to 66°55.33'S 62°32.16'E, 113 m, epibenthic sled, 11 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-124. —13 specimens, NMV J38271, N end of Fram Bank, Antarctica, 67°05.03'S 68°58.80'E to 67°05.24'S 68°58.51'E, 204–216 m, WHOI epibenthic sled, 13 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-131. —10 specimens, NMV J38272, Amery Depression, Antarctica, 68°04.36'S 72°17.81'E to 68°04.44'S 72°18.11'E, 765 m, epibenthic sled, 17 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-151. —5 specimens, NMV J38273, Amery Depression, Antarctica, 68°26.47'S 72°17.81'E to 68°54.82'S 73°37.53'E, 765 m, epibenthic sled, 17 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-154. —1 specimen, NMV J38274, off the Larsemann Hills, eastern Prydz Bay, Antarctica, 68°54.88'S 76°37.03'E to 68°54.82'S 76°37.71'E, 667–716 m, epibenthic sled, 18 February 1993, M. O'Loughlin on RSV *Aurora Australis*, stn AA93-158.

Type locality. Antarctic Peninsula, 63°22'S 54°10'W, 0–223 m over water depth 235 m.

Remarks. These records extend the known distribution of *L. infissum* into the eastern Antarctic.

Distribution. Antarctic Peninsula, Amery Depression, MacRobertson Shelf and Prydz Bay, Antarctica; 113–765 m depth.

Lepidepecreum tourville n.sp.

Figs. 23–25

Type material. HOLOTYPE, female, ovigerous (9 eggs), 5.8 mm, NMV J47730; 1 PARATYPE, male, 5.6 mm, NMV J17159; 3 PARATYPES, (2 ovigerous females, 1 immature), AM P57739; 48 km ENE Cape Tourville, Tasmania, Australia, 42°00.25'S 148°43.55'E to 41°57.77'S 148°42.08'E, 1264–1130 m, gravel with lumps of sandy mud aggregate, WHOI epibenthic sled, G.C.B. Poore *et al.*, 30 October 1988, RV *Franklin* stn SLOPE 81. —1 PARATYPE, immature, NMV J47731, S of Point Hicks, Victoria, Australia, 38°25.90'S 148°58.60'E, 1850 m, muddy, sandstone, WHOI epibenthic sled, G.C.B. Poore *et al.*, 22 July 1986, RV *Franklin* stn SLOPE 25. —1 PARATYPE, ovigerous female, NMV J47732, S of Point Hicks, Victoria, Australia, 38°25.00'S 149°0.00'E, 1500 m, compacted clay, WHOI epibenthic sled, G.C.B. Poore *et al.*, 22 July 1986, RV *Franklin*, stn SLOPE 27. —1 PARATYPE, female, NMV J47733, ESE of Nowra, NSW, Australia, 54 km 34°52.72'S 151°15.04'E, 996 m, mud, fine sand, fine shell, WHOI epibenthic sled, G.C.B. Poore *et al.*, 22 October 1988, RV *Franklin* stn SLOPE 53.

Type locality. 48 km ENE of Cape Tourville, Tasmania, Australia, 42°00.25'S 148°43.55'E to 41°57.77'S 148°42.08'E, 1264–1130 m depth.

Description. Based on holotype female, 5.8 mm. Body expanded to form a lateral bulge. Head with lateral cephalic lobe semidome, apically subacute. *Antenna 1 peduncular article 1 with well-developed anterodistally subacute lobe; article 2 without anterodistal lobe;* accessory flagellum 2-articulate; flagellum with weak 1-field callynophore; robust setae absent from proximal articles; calceoli absent. Antenna 2 peduncular article 3 elongate; flagellum short, calceoli absent. Epistome/upper lip with epistome produced beyond upper lip, broadly rounded. Mandible molar columnar with oval, fully triturating surface; mandibular palp attached proximally, article 3 without proximal A3-setae. Maxilla 1

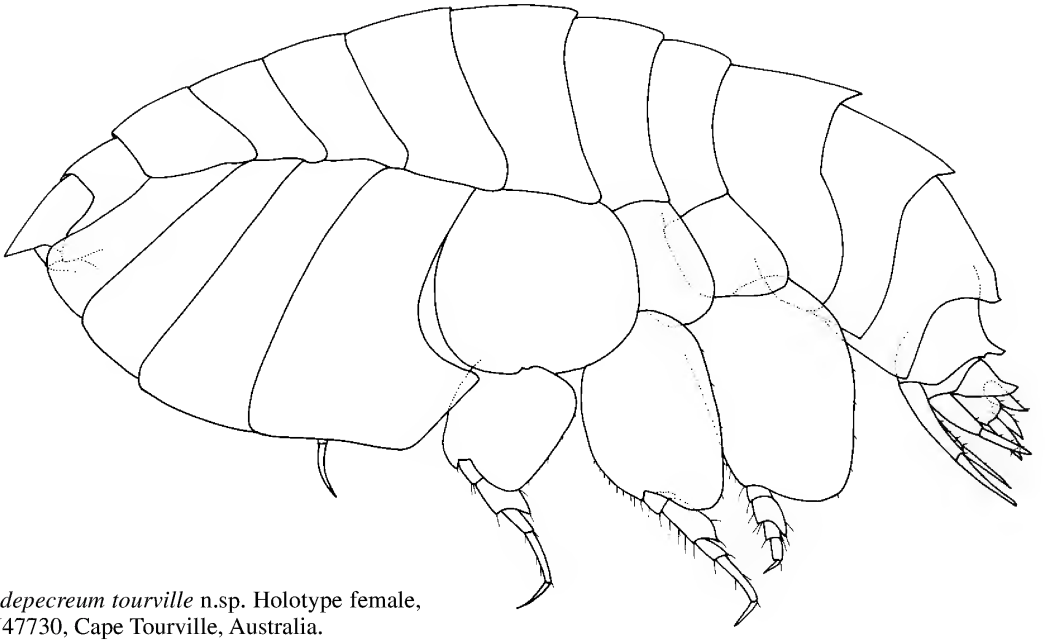

Figure 23. *Lepidepecreum tourville* n.sp. Holotype female, 5.8 mm, NMV J47730, Cape Tourville, Australia.

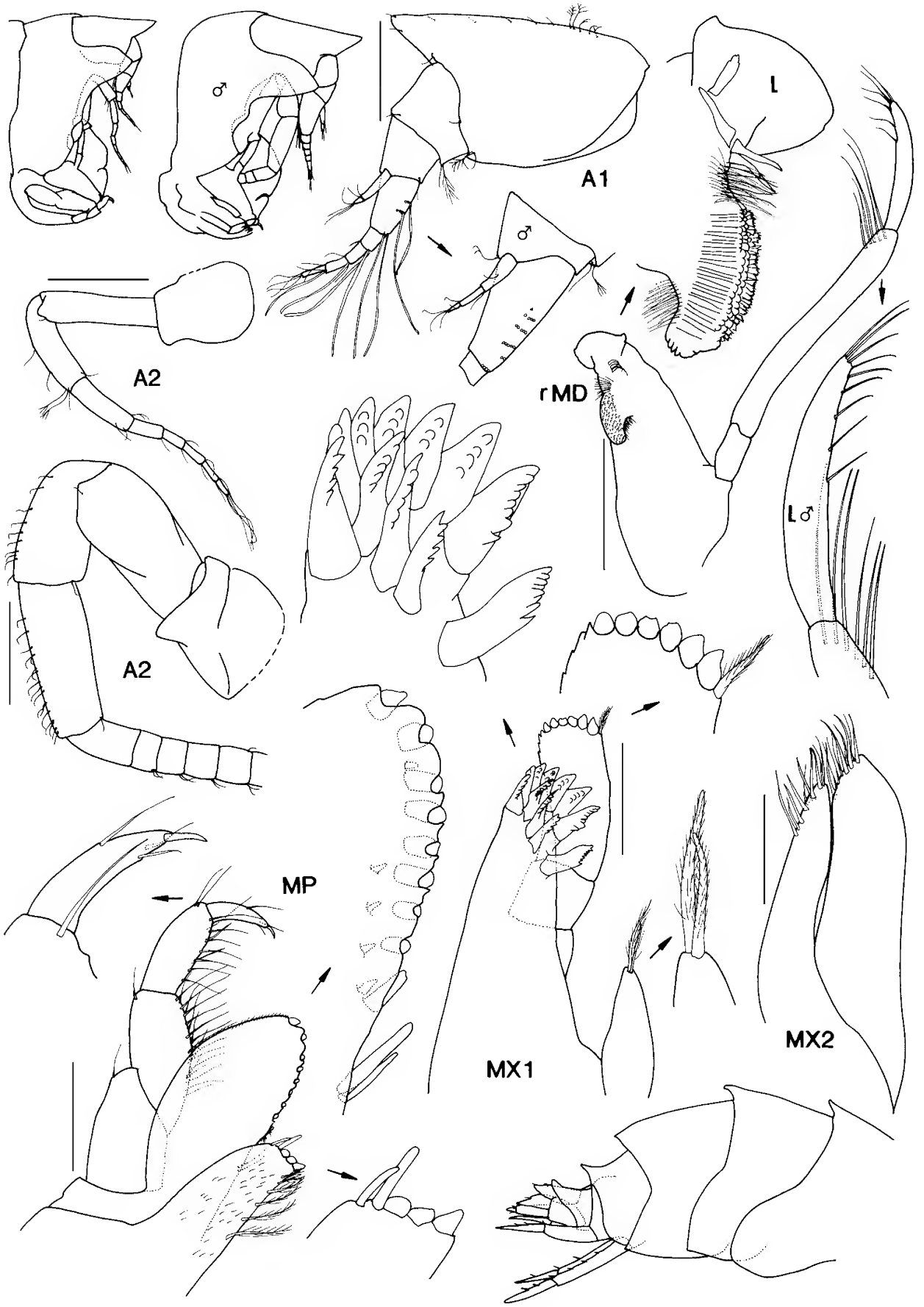

Figure 24. *Lepidepecreum tourville* n.sp. Holotype female, 5.8 mm, NMV J47730; paratype male, 5.6 mm, NMV J17159; Cape Tourville, Australia. Scales represent 0.2 mm.

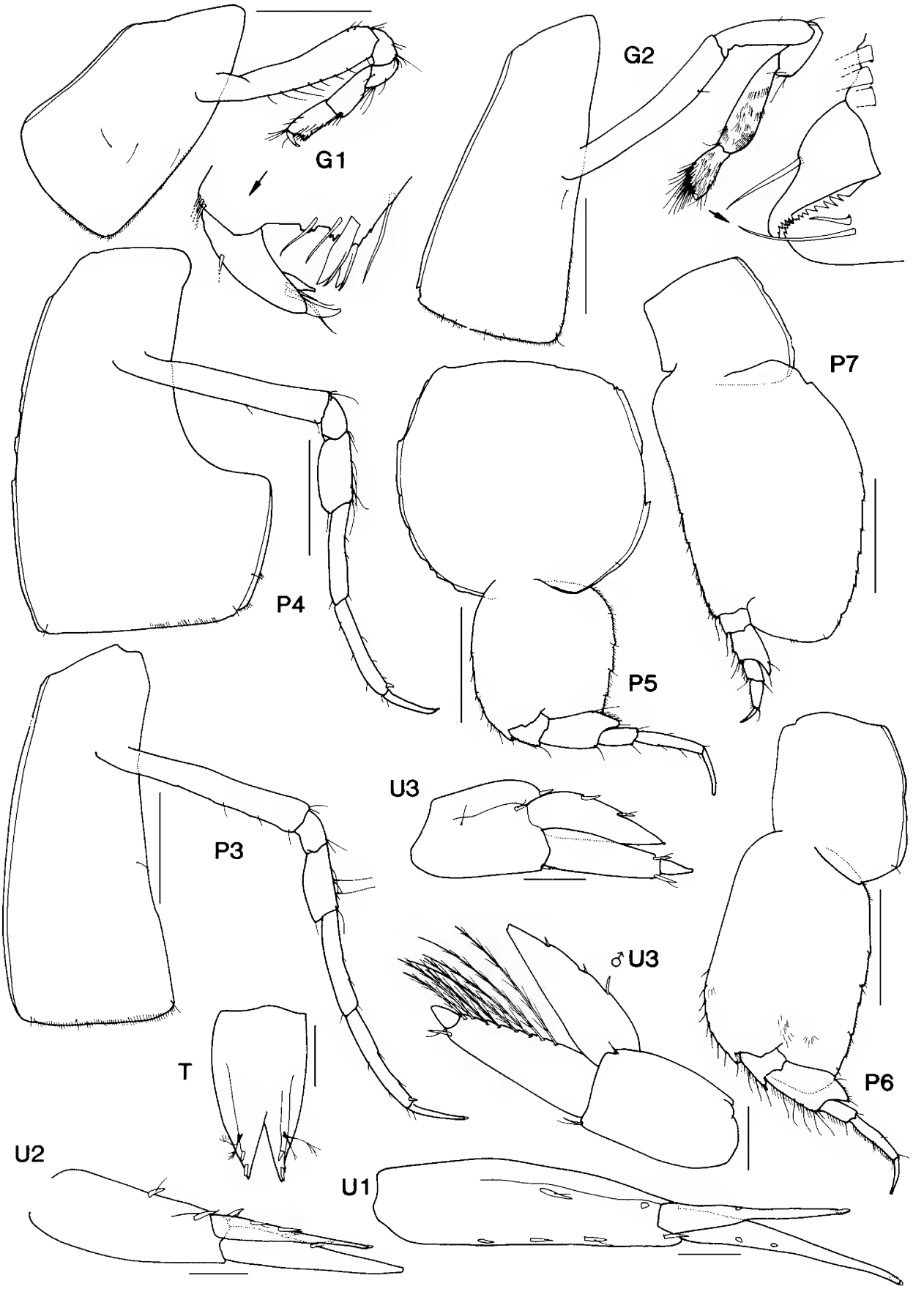

Figure 25. *Lepidepecreum tourville* n.sp. Holotype female, 5.8 mm, NMV J47730; paratype male, 5.6 mm, NMV J17159; Cape Tourville, Australia. Scales for U1–3 represent 0.1 mm, remainder represent 0.5 mm.

outer plate with left and right setal-tooth 7 asymmetrical, cuspidate distally; palp distal margin with apical robust setae. Maxilliped outer plate with 1 short, slender apical robust seta.

Gnathopod 1 subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; *basis moderately setose along anterior margin*; ischium short; carpus long, subequal in length to propodus, without posterior lobe; propodus with margins subparallel, *palm acute, entire, straight. Gnathopod 2 palm obtuse. Pereopod 4 coxa without distinct lateral ridge*, with a well-developed posteroventral lobe. *Pereonite 5 dorsally smooth. Pereopod 5 coxa without distinct lateral ridge, without umbo, basis about as long as broad. Pereopod 7 basis posterodistally produced less than halfway along merus.*

Pleonite 1 with mid-dorsal carina, *acutely produced posterodistally. Pleonite 2* with mid-dorsal carina, *acutely produced posterodistally.* Pleonite 3 with mid-dorsal carina, *produced dorsodistally, apically acute, posterodorsal margin produced. Epimeron 3* posterior margin smooth, *posteroventral corner subquadrate.* Urosomite 1 projecting over urosomite 2, dorsodistally acute. *Uropod 3 inner and outer rami well developed; outer ramus article 2 short*; without plumose setae on rami. *Telson moderately or slightly cleft*, with dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male, 5.6 mm. Antenna 2 flagellum elongate, calceoli absent. Uropod 3 with plumose setae on each ramus.

The only male specimen available for this species is not fully mature; although antenna 2 is long, another moult can be seen inside. The final male stage may develop calceoli.

Etymology. Named for Cape Tourville, near the type locality.

Remarks. *Lepidepecreum tourville* is the only Australian species of *Lepidepecreum* without a greatly produced basis on pereopod 7. However it does have an anterodistal lobe on peduncular article 1, but not on article 2 and it has dorsodistally produced pleonites 1 to 3, a combination of characters which also occurs in the group of taxa with a large basis on pereopod 7. In fact *L. tourville* appears to be most similar to *L. clypodentatum*. They differ mainly in the dorsodistal lobe of antenna 1, which is more rounded in *L. clypodentatum*, and in the development of the basis of pereopod 7.

Distribution. Southeastern Australia, Tasman Sea; 996–1850 m depth.

Lepidepecreum urometacarinatum Andres

Lepidepecreum carinatum Andres, 1983: 187, figs. 1, 2 [not *L. carinatum* Bate & Westwood, 1861].

Lepidepecreum urometacarinatum Andres, 1985: 134 [new name for *L. carinatum* Andres, 1983].–Barnard & Karaman, 1991: 496.–De Broyer & Jazdzewski, 1993: 70.

Material examined. 723 specimens (males, females and juveniles), USNM 306583; 50 specimens, AM P57740; Weddell Sea, Antarctica, 74°07'S 39°38'W, 731 m, epibenthic sled, 6 February 1968, USCGC *Glacier*, IWSOE cruise 1, stn 0001. —1 specimen, NMV J12923, off Enderby Land, Antarctica, Southern Ocean, 66°2.90'S 49°49.40'E to 66°3.00'S 49°49.40'E, 738 OR 806 m, epibenthic sled, M. Norman, MS *Nella Dan* stn HRD 012.

Type locality. Antarctic Peninsula, 64°00'S 64°30'W, 100–382 m over water depth 385 m.

Remarks. These records extend the known distribution of *L. urometacarinatum* into the eastern Antarctic.

Distribution. Antarctic Peninsula, Weddell Sea and Enderby Land, Antarctica; 100–806 m depth.

ACKNOWLEDGMENTS. We thank the late Eric Dahl, who originally made the LUCE lysianassoid amphipods available to us, Gary Poore (NMV), and Rafael Lemaitre (then of SOSC) for making other material available to us; Rachael Peart and Kate Dempsey for the illustrations; and Roger Springthorpe for making the plates.

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